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Patent Application Transmittal

(only for new nonprovisional applications under 37 C.F.R. 1.53(b))

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Date: January 7, 2000

Attorney Docket No.: 450100-3601.4

ASSISTANT COMMISSIONER FOR PATENTS

Box Patent Application

Washington, D.C. 20231

Sir:

With reference to the filing in the United States Patent and Trademark Office of an application for patent in the names of: Yoichiro Sako and Shigeyuki Yoneyama

entitled: SIGNAL REPRODUCING/RECORDING/TRANSMITTING METHOD AND APPARATUS AND SIGNAL RECORD MEDIUM

X Continuing Application

X Continuation      Divisional      Continuation-in-Part (CIP)  
of prior application Serial No. 08/690,224, filed July 19, 1996.

[Note: If priority under 35 U.S.C. 120 involves a series of respectively copending applications, then in this amendment identify each and its relationship to its immediate predecessor.]

X The prior application is assigned of record to Sony Corporation by virtue of an Assignment recorded in the U.S. Patent Office on December 9, 1996 at Reel 8310, Frame 0136.

     This is an application of a small entity under 37 CFR 1.9(f) and the amounts shown in parentheses below have been employed in calculating the fee:

     Small Entity Verified Statement(s) is (are) enclosed.

     Small Entity Verified Statement(s) filed in prior application, status still proper and desired

The following are enclosed:

X Specification (73 pages)

X 17 Sheets of Drawings

X 92 Claims (including 10 independent claims)

     This application contains a multiple dependent claim

X Our check for \$2,532.00, calculated on the basis of the claims as amended by any enclosed preliminary amendment as follows:

Basic Fee, \$690.00 (\$345.00)	\$ 690.00
Number of Claims in excess of 20 at \$18.00 (\$9.00) each:	\$ 1,296.00
Number of Independent Claims in excess of 3 at \$78.00 (\$39.00) h:	\$ 546.00
Multiple Dependent Claim Fee at \$260.00 (\$130.00)	
Total Filing Fee	\$ 2,532.00
Assignment Recording Fee \$40.00	

     This application is being filed within the month following the expiration of the term originally set therefor in the prior application. This is a petition to request a -month extension of time. A check covering the cost of the petition is enclosed.

Patent Application Transmittal

(only for new nonprovisional applications under 37 C.F.R. 1.53(b))

450100-3601.4

X Oath or Declaration and Power of Attorney

\_\_\_ New \_\_\_ signed \_\_\_ unsigned

X Copy from a prior application (37 C.F.R. 1.63(d))

Deletion of Inventors

\_\_\_ Signed Statement attached deleting inventor(s) named in the prior application (37 C.F.R. 1.63(d) (2) and 1.33(b))

Power of Attorney or Correspondence Address Change

X Power of attorney and/or correspondence address was changed during prosecution of the prior application. The new power of attorney is to William S. Frommer, Reg. No. 25,506. The new correspondence address is indicated above.

X Incorporation by Reference (for continuation or divisional application) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

X A Preliminary Amendment is enclosed.  
(Claims added by this amendment have been properly numbered consecutively beginning with the number next following the highest numbered original claim in the prior application.)

\_\_\_ Cancel in this application original claims \_\_\_ of the prior application before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

\_\_\_ New formal drawings are enclosed.

X Certified copy of each foreign priority application on which the claim for priority under 35 U.S.C. 119 is based was filed in prior U.S. application Serial No. 08/690,224, filed July 19, 1996. A list of said foreign priority application(s) is (are) provided below.  
Acknowledgement thereof is requested.

<u>Application No.</u>	<u>Filed</u>	<u>In</u>
07-185724	July 21, 1995	Japan
07-185725	July 21, 1995	Japan
08-121988	May 16, 1996	Japan

Please charge any additional fees required for the filing of this application or credit any overpayment to Deposit Account No. 50-0320.

Respectfully submitted,

FROMMER LAWRENCE & HAUG LLP  
Attorneys for Applicant(s)

By: 

Bruno Polito  
Reg. No. 38,580

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant(s) : Yoichiro Sako and Shigeyuki Yoneyama  
Serial No. : Continuation of 08/690,224  
For : SIGNAL  
REPRODUCING/RECORDING/TRANSMITTING  
METHOD AND APPARATUS AND SIGNAL  
RECORD MEDIUM  
Filed : Herewith  
Examiner : Bernarr Earl Gregory  
Art Unit : 2766

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Date of Deposit: January 7, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" Service under 37 CFR 1.10 on the date indicated above and is addressed to: Assistant Commissioner for Patents, Washington, DC 20231.

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(Signature of person mailing paper or fee)

**PRELIMINARY AMENDMENT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Prior to examination of the above-referenced Continuation application, please amend the application as follows.

IN THE CLAIMS

Please cancel claims 1-100.

Please add new claims 101-192 as follows:

--101. A method for reproducing digital data from a signal record medium, comprising the steps of:

reading out recording control information from a playback mode control signal area of said signal record medium, said recording control information being operable to control the playback mode of said record medium; and

changing, based on said recording control information, the phase of at least a portion of a color burst signal associated with an analog color video signal generated from said digital data.--

--102. The method according to claim 101, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--103. The method according to claim 101, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--104. The method according to claim 101, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--105. The method according to claim 101, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--106. The method according to claim 101, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--107. The method according to claim 101, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--108. The method according to claim 101, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--109. The method according to claim 101, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--110. The method according to claim 101, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--111. An apparatus for reproducing digital data from a signal recording medium, comprising:

means for reading out recording control information from a playback mode control signal area of said signal recording medium, said recording control information being operable to control the playback mode of said record medium; and

means for changing, based on said recording control information, the phase of at least a portion of a color burst signal associated with an analog color video signal generated from said digital data.--

--112. The apparatus according to claim 111, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--113. The apparatus according to claim 111, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--114. The apparatus according to claim 111, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--115. The apparatus according to claim 111, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--116. The apparatus according to claim 111, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--117. The apparatus according to claim 111, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--118. The apparatus according to claim 111, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--119. The apparatus according to claim 111, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--120. The apparatus according to claim 111, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--121. A method for reproducing a ciphered signal from a signal record medium, comprising the steps of:

reading out recording control information arrayed at a playback mode control signal area of said signal record medium;

deciphering said ciphered signal using at least a portion of said recording control information as key information for reproducing said signal to generate an analog color video signal; and

changing the phase of at least a portion of a color burst signal associated with said deciphered signal using at least a portion of said recording control information as key information.--

--122. The method according to claim 121, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--123. The method according to claim 121, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--124. The method according to claim 121, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--125. The method according to claim 121, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--126. The method according to claim 121, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--127. The method according to claim 121, wherein said step of changing includes adding at least two cycles to said color burst signal.--



--128. The method according to claim 121, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--129. The method according to claim 121, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--130. The method according to claim 121, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--131. A signal reproducing apparatus for reproducing a ciphered signal from a signal record medium comprising:

readout means for reading out recording control information arrayed at a playback mode control signal area of said signal record medium, said recording control information being operable to control the playback mode of said record medium;

deciphering means for deciphering said ciphered signal using at least a portion of said recording control information as key information to generate an analog color video signal;  
and

changing means for changing the phase of at least a portion of a color burst signal associated with said deciphered signal using at least a portion of said recording control information as key information.--

--132. The apparatus according to claim 131, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--133. The apparatus according to claim 131, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--134. The apparatus according to claim 131, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--135. The apparatus according to claim 131, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--136. The apparatus according to claim 131, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--137. The apparatus according to claim 131, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--138. The apparatus according to claim 131, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--139. The apparatus according to claim 131, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--140. The apparatus according to claim 131, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--141. A signal reproducing apparatus for reproducing a ciphered signal from a signal record medium comprising:

readout means for reading out recording control information arrayed at a playback mode control signal area of said signal record medium, said recording control information being operable to control the playback mode of said record medium;

deciphering means for deciphering said ciphered signal using at least a portion of said recording control information as key information to generate an analog color video signal; and

arraying means for arraying a signal coded with plural bits at a pre-set position in the analog signal using at least a portion of said recording control information as key information.--

--142. The signal reproducing apparatus as claimed in claim 141, wherein said analog signal is an analog video signal and said pre-set position is a predetermined horizontal period within a vertical blanking period of said analog video signal.--

--143. A method for receiving and reproducing transmitted digital data, comprising the steps of:

generating transmission control information from the received digital data;

changing, based on said transmission control information, the phase of at least a portion of a color burst signal associated with an analog color video signal generated from said digital data; and

performing a pre-set conversion on said digital data based on said transmission control information.--

--144. The method according to claim 143, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--145. The method according to claim 143, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--146. The method according to claim 143, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--147. The method according to claim 143, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--148. The method according to claim 143, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--149. The method according to claim 143, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--150. The method according to claim 143, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--151. The method according to claim 143, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--152. The method according to claim 143, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--153. An apparatus for receiving and reproducing transmitted digital data, comprising:  
means for generating transmission control information from the received digital data;

means for changing, based on said transmission control information, the phase of at least a portion of a color burst signal associated with an analog color video signal generated from said digital data; and

means for performing a pre-set conversion on said digital data.--

--154. The apparatus according to claim 153, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--155. The apparatus according to claim 153, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--156. The apparatus according to claim 153, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--157. The apparatus according to claim 153, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--158. The apparatus according to claim 153, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--159. The apparatus according to claim 153, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--160. The apparatus according to claim 153, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--161. The apparatus according to claim 153, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--162. The apparatus according to claim 153, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--163. A method for receiving a transmitted ciphered signal and reproducing the received signal, comprising the steps of:

- generating transmission control information from said received signal;
- deciphering said received signal using at least a portion of said transmission control information as key information to generate an analog color video signal; and
- changing the phase of at least a portion of a color burst signal associated with said color video signal using at least a portion of said transmission control information as key information.--

--164. The method according to claim 163, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--165. The method according to claim 163, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--166. The method according to claim 163, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--167. The method according to claim 163, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--168. The method according to claim 163, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--169. The method according to claim 163, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--170. The method according to claim 163, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--171. The method according to claim 163, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--



--172. The method according to claim 163, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--173. An apparatus for receiving and reproducing a transmitted ciphered signal, comprising:

means for recovering transmission control information which has been transmitted together with said ciphered signal;

means for deciphering said ciphered signal using at least a portion of said transmission control information as key information to generate an analog color video signal; and

means for changing the phase of at least a portion of a color burst signal associated with said color video signal using at least a portion of said transmission control information as key information.--

--174. The apparatus according to claim 173, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--175. The apparatus according to claim 173, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--176. The apparatus according to claim 173, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--177. The apparatus according to claim 173, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--178. The apparatus according to claim 173, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--179. The apparatus according to claim 173, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--180. The apparatus according to claim 173, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--181. The apparatus according to claim 173, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--182. The apparatus according to claim 173, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

--183. A video signal reproducing apparatus for reproducing a digital disc medium having recorded thereon a digital video signal and a recording control code for outputting at least an analog video signal, wherein said recording control code is arrayed in a playback mode control signal area of said disc, comprising:

detection means for detecting the state of the recording control code;

means for generating a recording scrambling signal;

D/A conversion means for converting the digital video signal reproduced from the digital disc medium into an analog video signal;

annexing means for annexing said recording scrambling signal in a pre-set area of a vertical blanking period of the D/A converted analog video signal by changing the phase of at least a portion of a color burst signal associated with said analog video signal; and

outputting means for outputting said analog video signal.--

--184. The apparatus according to claim 183, wherein a first half of said color burst signal is changed and a second half of said color burst signal is unchanged.--

--185. The apparatus according to claim 183, wherein a first half of said color burst signal is reversed in phase relative to a second half of said color burst signal.--

--186. The apparatus according to claim 183, wherein said color burst signal has eleven cycles and at least two cycles of said eleven cycles are changed in phase.--

--187. The apparatus according to claim 183, wherein said color burst signal has eleven cycles and about 5.5 cycles of said eleven cycles are changed in phase.--

--188. The apparatus according to claim 183, wherein at least 5.5 cycles of said color burst signal are changed in phase.--

--189. The apparatus according to claim 183, wherein said step of changing includes adding at least two cycles to said color burst signal.--

--190. The apparatus according to claim 183, wherein said color burst signal has a first portion and a second portion and a phase switching point exists between said first portion and said second portion.--

--191. The apparatus according to claim 183, wherein for every seventeen horizontal lines of said video signal the color burst signal associated with two lines of said seventeen lines is changed in phase.--

--192. The apparatus according to claim 183, wherein for every twenty one horizontal lines of said video signal the color burst signal associated with four lines of said twenty one lines is changed in phase.--

REMARKS

This Amendment is submitted prior to examination of the above-identified Continuation application. Claims 1-100 were pending in the parent application. In this Amendment, claims 1-100 have been canceled, and new claims 101-192 have been added.

Claims 101-192 thus remain for consideration.

Applicants respectfully submit that all of the claims now pending in the application are in condition for allowance, which action is earnestly solicited.


If any issues remain, or if the Examiner has any further suggestions, he/she is invited to call the undersigned at the telephone number provided below.

The Examiner is hereby authorized to charge any insufficient fees or credit any overpayment associated with the above-identified application to Deposit Account No. 50-0320.

The Examiner's consideration of this matter is gratefully acknowledged.

Respectfully submitted,  
FROMMER LAWRENCE & HAUG LLP

By:



Bruno Polito  
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PATENT  
450100-3601

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR LETTERS PATENT

09480735.010700

TITLE: SIGNAL REPRODUCING/RECORDING/TRANSMITTING  
METHOD AND APPARATUS AND SIGNAL RECORDING  
MEDIUM

INVENTORS: Yoichiro Sako  
Shigeyuki Yoneyama

William S. Frommer  
Registration No. 25,506  
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## TITLE OF THE INVENTION

Signal Reproducing/Recording/Transmitting Method and Apparatus and  
Signal Record Medium

## BACKGROUND OF THE INVENTION

### Field of the Invention

This invention relates to a signal recording apparatus, a signal record (recording , recordable or recorded) medium and a signal reproducing apparatus for prohibiting copying or unauthorized use.

### Description of the Related Art

Recently, with increased capacity and coming into widespread use of digital recording media, such as optical discs, prohibition of duplication or unauthorized use thereof has become crucial for protecting the copyright of recorded signals. That is, digital audio data or digital video data can be duplicated by copying or dubbing without deterioration, while computer data can be duplicated to give data which are the same as the original data, thus giving rise to troubles, such as copyright infringement, due to unauthorized copying.

With this in view, a pre-set ID bit for preventing unauthorized copying is occasionally recorded on an original signal record medium for prohibiting unauthorized copying in so-called digital dubbing in which data is reproduced from a digital record medium and re-recorded on another digital record medium.

For example, in a system for prohibiting the unauthorized

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copying in a digital audio data recording/reproducing apparatus termed a rotary head digital audio tape recorder (R-DAT), an inhibiting code for inhibiting digital copying or generation-serial copying, that is for copying generation limitation (inhibiting code of a standard of the serial copying management system or SCMS) is recorded in a main data area for digital audio signals recorded on a digital audio tape as a signal record medium, so that, when the inhibiting code is detected by the digital audio signal recording apparatus, copying recording of the digital audio signals on a new digital audio tape is inhibited.

Meanwhile, in digital dubbing of video signals, in which digital video signals, for example, recorded on a digital record medium, such as a digital disc or a digital tape, are reproduced and re-recorded on another record medium, a pre-set ID bit, that is the inhibiting code of a standard of the serial copying management system (SCMS), may be recorded in the original digital record medium.

In case of a recording system of recording the pre-set ID bit for prohibiting the unauthorized copying on the original digital record medium, the function of preventing unauthorized copying in the above-described digital dubbing operates satisfactorily. However, in case the digital video signals recorded on an original digital record medium are reproduced and D/A converted for analogically recording the converted analog video signals, or in case the analog video signals are again A/D converted for recording



in the digital form, the function of preventing unauthorized copying fails to operate satisfactorily, so that recording can be made directly.

That is, if the digital video signals recorded on the digital record medium is reproduced and D/A converted and the resulting analog video signals are directly recorded analogically or restored by A/D conversion to digital video signals for digital recording, the video signals resulting from dubbing are deteriorated in signal quality to an extremely small extent. This means that copyright protection is not assured sufficiently, and hence a system is required which positively prohibits such unauthorized copying. In particular, large-capacity disc-shaped recording media have recently become popular, such that a demand has been raised for suitable measures against unauthorized copying of digital video signals recorded on the disc-shaped record medium.

On the other hand, if the pre-set ID bit provided for prohibiting unauthorized copying is skipped in reading, unauthorized copying can be achieved easily. Therefore, suitable measures for prohibiting unauthorized copying by skipping in reading have also been desired.

#### SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a signal reproducing method and apparatus, a signal recording method and apparatus, a signal transmitting method and apparatus and a signal record(recording ,recordable or recorded) medium

whereby it is possible to prevent unauthorized copying by skipping in reading and it is also possible to inhibit unauthorized copying of analog signal converted from digital data digitally or analogically as well as to inhibit generation-serial copying.

With the method and apparatus for reproducing a signal according to the present invention, digital data or an analog signal D/A converted from the digital data are converted in a pre-set manner based on the recording control information arrayed in a playback mode control signal area and/or each sector header of a signal record medium.

With the method and apparatus for recording a signal according to the present invention, a signal is ciphered using at least a portion of the recording control information designed for controlling the recording on a signal record medium as the key information, or by the key information specified by at least a portion of the recording control information, with this recording control information being arrayed at a pre-set position of a playback mode control signal area of the signal record medium and/or at a pre-set position of each signal recording unit on the signal record medium and being recorded along with the ciphered signal on the signal record medium.

With the method and apparatus for transmitting a signal according to the present invention, digital data or an analog signal D/A converted from the digital data are converted in a pre-set manner based on the recording control information ancillary to

transmitted digital data.

With the method and apparatus for transmitting a signal according to the present invention, the signal is ciphered using at least a portion of the transmission management information designed to supervise signal transmission as the key information, or by the key information specified by at least a portion of the recording control information and the transmission management information is transmitted along with the ciphered signal.

With the signal record medium of the present invention, the recording control information for supervising the signal recording on the signal record medium is recorded at a pre-set position in a playback mode control signal area and/or at a pre-set position in each signal recording unit. At least a portion of the recording control information is used as the key information for ciphering the recording signal.

That is, with the present invention, both digital data and the analog signal are converted in a pre-set manner based on the recording control information or the transmission control information. The pre-set conversion may be ciphering or scrambling, for example, for digital data and for analog signals, respectively, whereby both the unauthorized digital copying and unauthorized analog copying may be prohibited from occurring. According to the present invention, since the signal is ciphered based on the recording control information or the transmission control information, deciphering is not feasible if the reading of the

recording control information or the transmission control information is skipped, thus enabling prevention of unauthorized copying.

With the video signal reproducing apparatus and method of the present invention, a digital signal is reproduced from a digital disc medium having recorded thereon the video recording control code arrayed in a playback mode control signal recording area provided at a beginning end of a spirally extending recording track and/or in each header of the digital video signal divided into sectors, along with the digital video signal, for ultimately producing at least the analog video signal output. The state of the video recording control code is detected, and the video recording scrambling signal of the mode of the analog video signal and/or the recording inhibiting signal is generated on the basis of the detection output. The video recording scrambling signal and/or the video recording inhibiting signal is annexed in a pre-set area of the vertical blanking period of the analog video output signal converted from the digital video signal and the resulting analog video signal is outputted.

With the video reproducing/recording combination apparatus and method of the present invention, a digital disc medium, having recorded thereon the digital video signal and the video recording control signal, is reproduced for outputting at least the analog video signal, and the output analog video signal is recorded. The video recording scrambling signal of the analog signal mode is

generated based on a status detection output of the video recording control code. The generated video recording scrambling signal is annexed in a pre-set area of a vertical blanking period of the analog video signal converted from the digital video signal, and the resulting analog video signal is outputted. Also the input analog video signal, amplitude-adjusted by an automatic amplitude adjustment unit, which is responsive to the video recording scrambling signal contained in the input analog video signal, is recorded on an analog video record medium.

With the video reproducing/recording combination apparatus and method of the present invention, a video recording inhibiting signal of the analog video signal mode is generated on the basis of a state detection output of the video recording control code. The generated video recording inhibiting signal is annexed in a pre-set area of a vertical blanking period of an analog video signal obtained on conversion of the digital video signal, and the resulting analog video signal is outputted. Also the input analog video signal is recorded on an analog video record medium after amplitude adjustment by automatic amplitude adjustment means which responds to the video recording scrambling signal contained in the input analog signal.

With the digital disc medium, designed for coping with the video signal reproducing method of the present invention, a video recording control code, which is a signal functioning for generating the video recording scrambling signal and/or video

recording inhibiting signal, is recorded thereon along with the digitized video signal.

That is, according to the present invention, a video recording scrambling signal of the analog signal mode and/or the video recording inhibiting signal is annexed to the analog video signal, D/A converted from the digital video signal read out from the digital disc medium when outputting the analog video signal. The analog video signal, to which is annexed the video recording scrambling signal and/or the video recording inhibiting signal, is analogically or digitally recorded on the record medium. The video signals reproduced from the recorded analog or digital disc medium is scrambled, or inhibited for video recording.

According to the present invention, both the digital data and the analog data are converted in a pre-set manner based on the recording control information and the recording control information. The pre-set conversion includes ciphering for the digital data and scrambling for the analog data. It becomes possible in this manner to inhibit unauthorized analog or digital copying of analog signals temporarily converted from digital data as well as serial generation copying, while it becomes possible to combat unauthorized copying of both the analog and digital data. In addition, since the signal is ciphered based on the recording control information or the transmission control information, deciphering becomes impossible if the recording control information or the transmission control information is skipped in reading, thus

enabling inhibition of unauthorized copying.

That is, according to the present invention, if at least the analog video signal is reproduced from the digital disc medium, having recorded thereon the digital video signal and the video recording control signal, arrayed in the playback mode control signal area at the beginning portion of a recording track and/or in each header of the digital video signal divided into sectors, the video recording scrambling signal and/or the video recording inhibiting signal is generated based on the detection output of the state of the video recording control mode and annexed in a pre-set area of a vertical blanking period of an analog video signal, converted from the digital video signal, and the resulting analog video signal is outputted. If the digital disc medium is copied, it is the analog video signal, having annexed thereto the video recording scrambling signal and/or the video recording inhibiting signal, that is analogically or digitally recorded, such that the video signal reproduced from the recorded analog or digital disc medium is a scrambled signal, or cannot inherently be reproduced. Thus it becomes possible with the present invention to inhibit unauthorized analog or digital copying of analog video signals converted from the digital video signals recorded on the digital disc medium, or to inhibit serial generational copying.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 illustrates a step of manufacturing a master disc and a step of reproducing a duplicated disc.

Fig.2 illustrates the copy management information.

Fig.3 is a circuit diagram for illustrating a scrambling circuit.

Fig.4 illustrates the structure of an optical disc.

Fig.5 illustrates the structure of a data sector.

Fig.6 illustrates the structure of a TOC sector.

Fig.7 illustrates another embodiment of a step of manufacturing a master disc and a step of reproducing a duplicated disc.

Fig.8 is a waveform diagram showing the state in which a protection code signal has been appended to an analog video signal.

Fig.9 is a block circuit diagram showing the structure of an arrangement for prohibiting unauthorized copying in which digital video signals are converted into analog video signals which are again converted into analog video data for copying.

Fig.10 is a waveform diagram showing the state in which an analog protection code signal has been appended to an analog video signal.

Fig.11 is a block circuit diagram showing the structure of an arrangement for prohibiting unauthorized copying in which digital video signals are converted into analog video signals which are again converted into an log video data for analog copying.

Fig.12 is a waveform diagram showing the state in which an analog protection code signal and a protect code signal have been appended to an analog video signal.



Fig.13 is a block circuit diagram showing the structure of an arrangement for prohibiting unauthorized copying in which digital video signals are converted into analog video signals which are analogically and digitally copied.

Fig.14 illustrates another illustrative example of the copy management information.

Fig.15 illustrates a color burst inverting operation.

Fig.16 is a circuit diagram for illustrating another example of the scrambling circuit.

Fig.17 illustrates another example of a sector format.

Fig.18 illustrates another embodiment of a sector header of the sector format of Fig.17.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, preferred embodiments of the present invention will be explained in detail.

An optical disc is used as the digital record(recording ,recordable or recorded) medium of the present invention, and the process flow until completion of the optical disc is explained by referring to Fig.1.

First, in a mastering step 30 of fabricating a master disc MD, digital video data converted from a motion picture film, digital data sent directly from a digital camera, or digital video data from a digital VTR for a broadcasting station, are supplied to a terminal 1. The digital video data, for example, supplied via the terminal 1, is sent to a compression encoding circuit 2, where it



of the lead-in area provided at a beginning end of a spirally extending track of an optical disc at the innermost or outermost rim of the optical disc and within the header of the data sector in the program area. In the following description, the copying management information is appended in one or both of the TOC area and the header of the data sector. Thus the copying management information appending circuit has an appendage circuit 4 for appending the copying management information within the TOC and an appendage circuit 5 for appending the copying management information in the data sector header.

The copying management information is made up of one or both of the information specifying the effect that both analog and digital copying or only digital copying inhibition be inhibited, and the information specifying the effect that limitation be placed on the copying generation. In the following, it is assumed that both information be included in the copying management information. It is possible that the charging information be included in the copying management information. By including the charging information in the copying management information, it becomes possible to make only the picture reproduction be charge-free and to permit copying only on payment of a charged fee, that it to inhibit charge-free copying.

The copying management information for this case may be made up of eight bits b7 to b0 as shown in Fig.2. Of these eight bits, the upper two bits b7 and b6 are allocated as a bit CMc instructing

generation limitation, while the three lower bits b2, b1 and b0 are allocated as bits CM<sub>M</sub> instructing copying inhibition of both digital and analog data or only of digital data. For example, the CM<sub>M</sub> bits (b2, b1, b0) of (1, 1, 1) and (0, 1, 1) mean inhibition of both digital and analog copying and inhibition of digital copying, respectively. The bit CM<sub>C</sub> allocated to generation limitation in the above copying management information in the fabrication process of the master disc MD specifies that the disc is an original disc.

It may be contemplated to allocate only the bit b2 as a bit CM<sub>M</sub> specifying that the copying be inhibited or not inhibited.

The purpose of inserting the copying management information on the sector basis is to array the information in a segmented state in a disc instead of on the overall disc surface in order to cope with different categories of the video signals, that is in order to accommodate the situation in which plural sorts of video signals of different categories are contained in a disc and are not designed to be managed monistically, as in the case of the CD-ROM. The copying management information may also be appended on the block basis instead of on the sector basis.

The data to which the copying management information has been appended by the copying management information appending circuit is sent to an encoder/modulation circuit 6. The encoder/modulation circuit 6 performs data delaying and parity calculations, as error correction encoding operations, on the supplied data, and modulates 8-bit data, for example, on the supplied data to form 16-channel

bit modulated data in accordance with a pre-set modulation system. The encoder/modulation circuit 6 also appends synchronization signals of a so-called out-of-rule pattern violating the modulation rule of the above pre-set modulation system every pre-set data amount and sends the resulting data to an optical head unit 7.

The optical head device 7 radiates a laser beam driven based on data supplied from the encoder/modulation circuit 6 to a master disc MD rotated by a rotation servo controlled spindle motor 8 for effecting optical recording. This completes fabrication of a master disc MD having data recorded thereon.

The scrambling circuit 9 is arranged as shown for example in Fig.3.

Referring to Fig.3, a so-called parallel block synchronization type scrambler, employing a 15-bit shift register, may be used as the scrambling circuit 9. To a data input terminal 45 of the scrambler, there is entered data comprised of 2048 byte data of a data portion of Fig.5 or TOC data portion of Fig.6, from the compression encoding circuit 2, and 4-byte error detection code (EDC), appended thereto, in a sequence in which the least significant bit (LSB) comes first, that is in an LSB first sequence. The scrambling circuit 14 includes a 15-bit shift register 41 for scrambling for which feedback is applied in accordance with a generating polynomial  $x^{15} + x + 1$ , using an exclusive OR (ExOR) circuit 42. In the 15-bit shift register 41, pre-set values or initial values are variably set in accordance

with bits b2, b1, b0 (1,1,1 or 0,1,1) of the bits  $CM_M$  of the copying management information as shown in Fig.2 so that the pre-set values or initial values will be switched on the sector basis. The pre-set values may also be variably set by both the bits  $CM_M$  and  $CM_C$  instead of being variably set solely by the bit  $CM_M$ . Output data of the shift register 41 and input data from the terminal 45 are Ex-ORed by the ExOR circuit 43 so as to be taken out as scrambled data at a terminal 44 and thence supplied to the copy management information appending circuit shown in Fig.1.

In a replication step 40, plural optical discs D are prepared by press working from the master disc MD produced in a manner as described above.

An disc D, duplicated from the master disc MD by the replication step 40, has a center aperture 102. Looking from the inner rim towards the outer rim of the disc-shaped record medium D, there are formed a lead-in area 103, as a program management region or TOC region, a program area 104 having program data recorded therein, and a program end area, or a so-called lead-out area 105. In an optical disc for reproducing audio or video signals, the audio or video signals, encoded for compression as described above, are recorded in the program area 104, while the time information or the like for the audio or video data is managed by the lead-in area 103. The above-mentioned copying management information is recorded in the TOC sector of the lead-in area 103 and/or in the data sector header in the program area 104.







explained and a digital interfacing circuit 26 so as to be outputted as digital video data at a digital output terminal 27.

The copying management information readout circuit includes a read-out circuit 18 for reading out the appended copying management information from the header of the data sector and a read-out circuit 17 for reading out the appended copying management information from the TOC data area of the TOC sector, and sends the copying management information read out from the data of the sector resolution circuit 16 to a copying information management circuit 19. If the copying management information is appended to only one of the TOC and the data sector header, only one corresponding circuit of the two read-out circuits 17, 18 is employed.

The copying information management circuit 19 judges which of inhibition of analog and digital copy inhibition and inhibition of only of digital copying is specified by the bit  $CM_M$  of Fig.2, and which generation number of the copying inhibition is specified by the bit  $CM_C$ , and outputs a decision signal responsive to the results of decision. The decision signals are sent to a protect signal generation circuit 20. The copying information management circuit 19 sends the copying management information to the descrambling circuit 31.

The descrambling circuit 31 has a structure similar to that of the scrambling circuit 9 of Fig.3. In this descrambling circuit 31, pre-set values or initial values, derived from the copying management information from the copying information management

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circuit 19, are variably set. This allows the descrambling circuit 31 to perform descrambling, that is deciphering, which is a reverse operation of the scrambling operation performed by the scrambling circuit 9. Stated differently, the descrambling circuit 31 cannot perform descrambling if there is no copying management information read out by the copying management information readout circuit from the data sector header or from the TOC data area of the TOC sector and supplied via the copying information management circuit 19. The data descrambled by the descrambling circuit 31 is sent to the expansion decoding circuit 21. Meanwhile, the pre-set value or the initial value of the descrambling circuit 321 can also be set on the basis of the key information specified by the copying management information.

Similarly to the scrambling circuit 9, a digital descrambling circuit 32, fed with digital data from the expansion decoding circuit 21, performs digital descrambling on digital video data from the expansion decoding circuit 21 based on the copying management information. This outputs descrambled digital video data from the digital descrambling circuit 32 at the digital interfacing circuit 26. It is also possible with the digital descrambling circuit 32 to perform descrambling based on the key information specified by the copying management information.

In connection with digital dubbing, in which digital data reproduced from a signal recorded on an optical disc, that is a digital record medium, is recorded as digital data in another

digital record medium, there is known a technique of recording a pre-set ID bit, such as that discussed in relation with the prior art, on an optical disc as the copying management information, with a view to prohibiting unauthorized copying. However, unauthorized copying can be easily realized if the copying management information is skipped in reading.

If, in the embodiment of the present invention, the copying management information is skipped in reading the copying management information from the data sector header or TOC data area, with a view to unauthorized copying, the digital data recorded on the optical disc has been scrambled based on the copying management information and hence cannot be descrambled, thus prohibiting such unauthorized copying. In addition, with the embodiment of the present invention, since the digital scrambling is performed by the digital scrambling circuit 32 on the basis of the copying management information, the digital scrambled digital data is copied by digital dubbing. However, the above copying management information is required for descrambling. This again is effective to prohibit unauthorized copying.

In the above-described embodiment, the digital scrambling circuit 32 is provided upstream of the digital interfacing circuit 26. However, a switch 33 may also be provided in place of the scrambling circuit 32. If, in such case, the contents of the copying management information indicate copying prohibition, and the switch 33 is controlled to be turned off, digital video data

is not outputted by the digital interfacing circuit 26, thus enabling the prohibition of unauthorized copying in the case of digital copying. If such switch 33 is used, the signal sent from the copying information management circuit 19 to the switch 33 is a switch setting control signal corresponding to the contents of the copying management information.

If, in the digital dubbing, the bit  $CM_c$  of the copying management information for copying generation limitation permits copying of the current generation, digital data may directly be outputted without the digital scrambling circuit 32 performing the digital scrambling operation, that is, with the switch 33 being turned on, if such switch 33 is provided. However, in the embodiment of Fig.2, since the bit  $CM_m$  in any case is of a value inhibiting digital copying, the switch 33 is not turned on in the embodiment of Fig.2.

Fig.7 shows an embodiment in which the copying is inhibited by the switch 22, without performing scrambling or descrambling such as one described above.

In the embodiment of Fig.7, data compressed in volume and formed into sectors by the compression encoding circuit 2 in the mastering step 30 is directly sent to a copying management information appendage circuit, that is an appendage circuit 4 for appending the copying management information in a TOC and an appendage circuit 5 for appending the copying management information in the data sector header. In the reproducing device

50, digital video data resolved into sectors by the sector resolution circuit 16 is directly sent to the expansion decoding circuit 21 via a copying management information readout circuit, that is read-out circuits 17 and 18 for reading out the copying management information from the TOC data area and the data sector header, respectively. The digital data from the expansion decoding circuit 21 is sent via the switch 22 to the digital interfacing circuit 26. A decision signal from the copying information management circuit 19 is sent to the protect signal generating circuit 20, while being sent as a switching control signal to the switch 22. The present embodiment is otherwise similar in structure to the embodiment of Fig.1, so that corresponding portions are denoted by the same reference numerals and the corresponding description is not made for clarity.

If, in the embodiment of Fig.7, the above result of decision indicates copying inhibition, the switch 22 is turned off by a switching control signal corresponding to the result of decision. Meanwhile, if the generation limitation bit CMc of the copying management information specifies that the disc is not an original disc and is of a generation specifying copying inhibition, a switching control signal which turns off the switch 22 is outputted by the copying information management circuit 19. This inhibits outputting of digital video data from the digital interfacing circuit 26, so that it becomes possible to prohibit unauthorized copying in digital dubbing in which digital data reproduced from

a signal recorded on an optical disc D (digital disc medium) is directly recorded as digital data on a separate digital disc medium.

With the embodiment of the present invention, in case of digital or analog copying by the intermediary of an analog interface, in which digital video data recorded on an original digital record medium is reproduced and D/A converted into analog video signals, these D/A converted analog signals are transmitted via an analog interface having an analog output or an analog input terminal, and the analog video signals are subsequently again A/D converted to digital video signals for digital recording, or the analog video signals are directly analogically recorded, unauthorized copying may be prohibited by generating a protect signal as explained later by referring to Figs.8, 10 and 12 by the protect signal generating circuit 20 and by mixing the protect signal in the analog video signals by the mixing circuit 24.

Referring first to Figs.8 and 9, inhibition of unauthorized copying is explained in connection with a case in which digital vide data recorded on a digital record medium is reproduced and once D/A converted into analog video signals, these analog video signals being again A/D converted by the intermediary of an analog interface to digital video signals, which are recorded as digital data.

In the following description, it is assumed that the generation limitation bit CM<sub>c</sub> of the copying management information

allows only for one-generation copying, that is, it does not permit reproduction of copied data as from the second and following generations, as counted from the original.

In the reproducing apparatus 50 for an optical disc D shown in Fig.9, the copying information management circuit 19 decides whether the bit  $CM_M$  of the copying management information specifies inhibition copying of both analog and digital data or only digital data, and also which generation the bit  $CM_C$  specifies as copying generation limitation. A decision signal corresponding to the result of decision is sent to the protect signal generation circuit 20.

If the bit  $CM_M$  of the copying management information does not specify inhibition of analog copying, and the generation limitation bit  $CM_C$  specifies that the disc is an original disc, a protect code signal generating circuit 74 within the protect signal generation circuit 20 generates and outputs a protect code signal PCS specifying that effect by plural coded bits.

This protect code signal PCS is sent to the mixing circuit 24 which then mixes the protect code signal PCS in a pre-set horizontal period within a vertical blanking period of an analog video signal, as shown in Fig.8. Meanwhile, the protect code signal PCS is inserted at the 20Hth horizontal period and at the 283Hth horizontal period, where H denotes horizontal period, for an odd field and for an even field, respectively. The protect code signal PCS, mixed into the analog video signal, is made up of, for

example, 14-bit data and 6-bit error detection correction code (CRCC), wherein the 8 bits following the 4-bit header in the 14-bit data are allocated in the similar manner to the copying management information described previously. The analog video signal, having the analog protect code signal appended thereto, is outputted at an analog output terminal 29.

The analog output terminal 29 of the reproducing apparatus 50 is connected to an analog input terminal 81 of an optical disc recording/reproducing apparatus 80, employing a recordable optical disc RD as a record medium, as an example of a video signal reproducing apparatus. The analog video signal with the appended protect code signal, outputted by the output terminal 29 of the reproducing apparatus, is A/D converted by the disc recording/reproducing apparatus 80 into digital video data which is digitally recorded on the optical disc DD. That is, the recording for this case is the first generation copying from an original disc.

With the optical disc recording/reproducing apparatus 80, the analog video signals supplied via the analog input terminal 81 is converted by an A/D conversion circuit 82 into digital video data which is sent to a compression encoding circuit 83, where it is encoded for compression according to the MPEG2 standard and formed into sectors in terms of 2048 bytes as a unit. The data encoded for compression in the compression encoding circuit 83 and formed into sectors is sent to a scrambling circuit 85.



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The analog video signal, to which the protect code has been appended and which has been supplied to the analog input terminal 81, is also sent to a protect code signal detection circuit 88. The protect code signal detection circuit 88 detects the possible presence of the protect code signal appended to the vertical blanking period of the analog video signal as shown in Fig.8 and the state of the protect code signal and newly generates the copying management information based on the detected protect code signal. The protect code signal supplied at this time to the protect code signal detection circuit 88 specifies that the disc is copied from the original disc and is permitted for the first generation copying as counted from the original disc.

Thus the protect code signal detection circuit 88 modifies the generation limitation bit  $CM_c$  of the copying management information to a value specifying that the disc is a first generation copy as counted from the original disc, and outputs the modified value.

The copying management information from the protect code signal detection circuit 88 is sent to the scrambling circuit 85 and to the copying management information appendage circuit.

Similarly to the scrambling circuit 9 of Fig.1, the scrambling circuit 85 scrambles output data of the compression encoding circuit 83 based on the copying management information from the protect code signal detection circuit 88. The scrambled data from the scrambling circuit 85 is sent to the copying management information appendage circuit. Meanwhile, a ciphering circuit may

be used in place of the scrambling circuit 85. The copying management information appendage circuit has an appendage circuit 86 for appending the copying management information into the TOC and an appendage circuit 87 for appending the copying management information into the data sector header, as explained previously. The scrambled data, having the copying management information appended thereto as previously explained by the copying management information appendage circuit, is sent to an encoder/modulation circuit 89.

The encoder/modulation circuit 89 performs data delaying and parity calculation operations on the supplied data for appending parity data and converts the resulting data in accordance with a pre-set modulation system from, for example, 8-bit data into 16 channel bit modulated data. The encoder/modulation circuit 89 appends synchronization signals of a so-called out-of-rule pattern violating the modulation rule of the pre-set modulation system, in terms of a pre-set data amount as a unit, and sends the resulting data to an optical head device 90.

The optical head device 90 effects optical recording by radiating a laser beam excited based on data supplied from the encoder/modulation circuit 89 to the recordable optical disc RD run in rotation by a rotation servo controlled spindle motor 91. For recording on the optical disc RD, so-called magneto-optical recording may be used, in which case a magnetic head is provided facing the optical head device 90 with the optical disc RD in-

between and the laser beam of a power high enough to heat a magnetic film formed on the optical disc RD to a temperature higher than the Curie temperature is radiated on the optical disc RD, while the magnetic head is driven based on the signal from the encoder/modulation circuit 89. In this manner, digital video data, corresponding to the digital video data from the original disc processed through the analog interface, is copied on the optical disc RD.

Next, if the optical disc RD, to which digital video data has been copied from the original disc, is reproduced and D/A converted into analog video signals, which are again converted by A/D conversion to digital video data, which in turn is recorded on a separate recordable optical disc RD, by way of performing the second-generation copying, the following measures are used to render data reproduction from the optical disc RD infeasible even if such second generation copying is performed. That is, if the disc RD, on which the first generation copying has been performed, is again loaded on the reproducing apparatus 50 of Fig.9 for reproduction, and the analog video signal resulting from the reproduction is again copied by the optical disc recording/reproducing apparatus 80 shown in Fig.9, the following measures are used.

That is, data read out from the optical disc RD by the reproducing apparatus 50 from the optical disc RD to which the first generation copying has been done as described above, is sent

to the copying management information readout circuits 17, 18, in the same way as explained previously. The copying management information taken out from the readout circuits 17, 18 is sent to the copying management information decision circuit 19.

A decision signal from the copying management information decision circuit 19 is sent to the protect signal generation circuit 20 from which the protect code signal PCS is generated and outputted to the mixing circuit 24. The mixing circuit 24 is fed with an analog video signal descrambled by the descrambling circuit 31, processed by the expansion decoding circuit 21 and D/A converted by the D/A conversion circuit 23. The protect code signal PCS is mixed by the mixing circuit 24 with the analog video signal and the resulting signal is outputted at the analog output terminal 29.

The analog output terminal 29 of the reproducing apparatus 29 is connected to the analog input terminal 81 of the optical disc recording/reproducing apparatus 80, such that the analog video signal having the program code signal appended thereto, outputted at the analog output terminal 9 of the reproducing apparatus 50, is supplied to the analog input terminal 81 of the disc recording/reproducing apparatus 80.

The disc recording/reproducing apparatus 80 converts the analog video signals supplied via analog input terminal 81 into digital video data by the A/D conversion circuit 82, and the compression encoding circuit 83 then performs compression encoding

and formation into sectors on the resulting digital video data. The resulting data is sent to the scrambling circuit 85.

The analog video signal supplied to the analog input terminal 81, having the protect code signal appended thereto, is also sent to the protect code signal detection circuit 88.

The protect code signal, supplied at this time to the protect code signal detection circuit 88, specifies that the optical disc is the first generation copy disc. The protect code signal detection circuit 88 converts the generation limitation bit  $CM_c$  of the copying management information to a value specifying that the disc is the second generation disc from the original disc, and outputs the resulting modified value.

The copying management information from the protect code signal detection circuit 88 is sent to the scrambling circuit 85 and to the copying management information appendage circuit. The scrambling circuit 85 scrambles output data of the compression encoding circuit 83 based on the copying management information from the protect code signal detection circuit 88, in a manner as explained previously. The copying management information appendage circuit appends the copying management information to scrambled data from the scrambling circuit 85 and outputs the resulting data.

If a ciphering circuit is used in place of the scrambling circuit 85, the protect code signal detection circuit 88 outputs a control signal for enabling ciphering by the ciphering circuit. The control signal may be the key information for ciphering. This

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outputs the ciphered digital video signal from the ciphering circuit.

Output data of the copying management information appendage circuit is corrected for errors and modulated by the encoder/modulation circuit 89 and thence supplied to an optical heads device 90 or a magnetic head for optical or magneto-optical recording in a manner as explained previously.

The optical disc RD, on which the second generation copying has been done as described above, is read out by the optical head device 90 of the optical disc recording/reproducing apparatus 80. The read-out data is sent to the reproducing system of the optical disc recording/reproducing apparatus 80.

A digital reproducing circuit 92 of the reproducing system has, in addition to main components, such as an RF circuit 12, demodulation circuit 14, an error correction circuit 15, a sector resolution circuit 16 and an expansion/decoding circuit 21, the above-mentioned copying management information readout circuit, copying management information decision circuit 19 and the descrambling circuit 31.

The copying management information decision circuit of the digital reproducing circuit 92 discriminates the generation limitation bit CM<sub>c</sub> of the copying management information read out from the optical disc RD and thus learns that the optical disc RD is a second generation copy disc. At this time, the copying management information decision circuit 19 of the digital

reproducing circuit 92 is designed not to output the copying management information to the descrambling circuit 31, or to output the non-scrambleable copying management information.

Thus the data sent to the expansion decoding circuit 21 in the digital reproducing circuit 92 is the non-descrambled data, so that, if the data is expanded and decoded by the expansion decoding circuit 21, regular digital video data cannot be produced.

With the above-described arrangement, in such a case wherein digital video data recorded on the original digital record medium is reproduced and temporarily D/A converted into analog video signals, which are again A/D converted into digital video data for digital recording, generation limitation becomes possible to prevent unauthorized copying. In the above case, the second generation data copying can be done on the optical disc RD. However, since the recorded data is not descrambled data, regular pictures cannot be obtained if the data is reproduced and displayed on a television receiver 71, thus prohibiting unauthorized copying.

If, in the case of digital copying via the analog interface, the copying management information is skipped in reading during reproduction of the optical disc RD by the reproducing apparatus 50 with a view to unauthorized copying as described above, since the digital data recorded on the optical disc RD is scrambled on the basis of the copying management information, the descrambling circuit 31 cannot descramble the data, while a protect code generation circuit 74 cannot generate the protect code signal based

on the copying management information, thus enabling prohibition of unauthorized copying. That is, since the optical disc recording/reproducing apparatus 80 cannot generate the copying management information based on the protect code signal, the scrambling circuit 85 cannot descramble data, thus enabling prevention of unauthorized copying. It may be envisaged to mask the protect code signal instead of skipping the reading of the copying management information with a view to unauthorized copying. In this case, the scrambling circuit 85 of the optical disc recording/reproducing apparatus 80 cannot descramble the data, thus assuring prevention of unauthorized copying.

In the above example, the first generation copying from the original disc is permitted. However, if the generation limitation bit CMc of the copying management information is selected for inhibiting the first generation copying, the first generation copying from the original disc is prohibited.

Also, in the above example, an optical disc RD recordable on the recording/reproducing apparatus 80 is used. Of course, similar prevention of copying can be achieved with a digital video data recording/reproducing apparatus for a video tape TP.

With the above example, the digital video data recorded on the original digital record medium is reproduced and temporarily converted into analog video signals which are again A/D converted into digital video signals for digital recording. However, unauthorized copying can be prohibited if an analog video signal



is recorded as it is analogically.

Referring to Figs.10 and 11, prevention of unauthorized copying is explained for a case in which digital video data recorded on an original digital record medium is reproduced and transiently D/A converted into analog video signals which are then analogically recorded on a conventional analog video tape recorder (analog VTR).

It is assumed in such case that, with the reproducing apparatus 50 for the optical disc D shown in Fig.11, the bit  $CM_M$  of the copying management information indicates inhibition of copying, and the decision signal from the decision circuit 19 indicates inhibition of analogical copying. It is also assumed that an analog protect pulse APP, which is a white peak signal, is generated by a protect pulse generating circuit 72 in the protect signal generating circuit 20. This analog protect pulse APP is mixed by the mixing circuit 24 in a pre-set period of the vertical blanking period of the analog video signal, as shown in Fig.11. The protect pulse generating circuit 72 also generates the analog protect pulse APP if the copying management information is not supplied. A decision signal corresponding to the inhibition of analog copying is outputted by the copying management information decision circuit 19 even if the generation limitation bit  $CM_G$  denoted by the copying management information specifies inhibition of analog copying of the current generation. The system of inhibiting analog copying is termed the analog protection system

(APC).

An output signal of the mixing circuit 24 is such a signal in which plural pairs of positive pulses and pseudo synchronization pulses of a pre-set sequence are appended to the video signal in the vertical blanking period of the analog video signal next to the synchronization pulse. In the illustrative case of Fig.10, plural pulse pairs of a pseudo synchronization pulse  $P_{12}$  and a positive pulse, such as a white peak pulse, are inserted next to two equalizing pulses  $P_{10}$  in a horizontal line (horizontal period). The technique of using a combination signal of these plural pseudo synchronization pulses and plural white peak signals as a recording scrambling signal is disclosed in JP Patent Kokai Publication JP-A-61-288582 (1986). The analog protection system (APS) employing this pseudo-sync pulse (PSP) is termed the PSP system.

The reason the normal picture recording becomes impossible on a usual video tape recorder (VTR) is now briefly explained.

It is assumed that the analog output terminal 29 of the reproducing apparatus 50 is connected to the analog input terminal 61 of the analog VTR 60, and the analog video signals, having appended thereto the above recording scrambling signal outputted by the analog output terminal 29 of the reproducing apparatus 50, are recorded on the video tape TP by an analog VTR 60.

Usually, the analog VTR 60 has an automatic gain control (AGC) circuit 62, as automatic amplitude adjustment means or automatic gain adjustment means, and is configured for automatically

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adjusting the amplitude of the analog video signal entering the analog input terminal 61. If the analog video signal shown in Fig.10 is supplied to the analog VTR 60 provided with such AGC circuit 62, the AGC circuit 62 responds to the white peak signal added in the vertical blanking period, thus narrowing the inherent video signal amplitude. That is, the AGC circuit 62 of a usual video tape recorder cannot distinguish the equalizing pulse  $P_{10}$  from the pseudo synchronization pulse  $P_{12}$  and hence samples the level of the appended positive pulse  $P_{14}$  such that it recognizes the positive pulse level as being several times as large in amplitude as the input signal level and manages control to lower the gain. If the analog video signal, automatically adjusted in amplitude by the AGC circuit 62, is recorded via the analog recording circuit 65 on the video tape TP, and subsequently reproduced by an analog reproducing circuit 67 in the television receiver 70 via an analog output terminal 68, an extremely ill-looking picture is produced due to unusual lightness level in the reproduced picture.

In this manner, inhibition of unauthorized copying, inclusive of generation limitation, becomes possible for a case in which digital video data recorded on an original digital record medium is reproduced and transiently D/A converted into analog video signals which are then analogically recorded on a conventional analog VTR.

If, in such analog copying via analog interface, the copying

management information is skipped in reading during reproduction of the optical disc RD in the reproducing apparatus 50 with a view to unauthorized copying in a manner as described above, the digital data recorded on the optical disc RD is scrambled based on the copying management information, and hence cannot be descrambled by the descrambling circuit 31. In addition, the protect code generating circuit 74 is designed to generate the protect pulse even if the copying management information is not supplied, thus enabling unauthorized copying.

In the example of the analog VTR 60 of Fig.11, the reaction of the AGC circuit 62 to the analog protect pulse APP is utilized. However, if a detection circuit 63 for detecting the analog protect pulse APP from the analog video signal supplied via analog input terminal 61 to the analog VTR 60 is provided, a switch 64 is provided, such as downstream of the AGC circuit 62, and the switch 64 is turned off on detection of the analog protect pulse APP, it becomes possible to inhibit unauthorized copying. That is, if the switch 64 is turned off, the analog video signal supplied to the analog input terminal 61 cannot be recorded on the video tape TP, it becomes possible to inhibit unauthorized copying.

In the above embodiment, description has been made on an analog VTR employing a video tape TP. It should however be noted that the above-described technique for copying inhibition can be utilized for an analog video disc recording/reproducing apparatus employing an analog video disc AD.

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In addition, according to the present invention, unauthorized copying can be inhibited both for a case in which the analog video signals are again A/D converted, transmitted via an analog interface and subsequently restored to digital video data which is digitally recorded, and for a case in which the analog video signals are transmitted via analog interface and directly recorded analogically, as shown in Figs.12 and 13.

Specifically, the copying management information decision circuit 19 in the reproducing apparatus 50 for the optical disc D includes a decision circuit 71 for discriminating the state of the bit  $CM_M$  of the copying management information, and a decision circuit 73 for discriminating the bit  $CM_C$  of the copying management information. The decision signals from the decision circuits 71, 73 are sent to the protect signal generating circuit 20, while the copying management information is sent to the descrambling circuit 31 and to the digital scrambling circuit 32.

The descrambling circuit 31 and the digital scrambling circuit 32 perform the operations similar to those explained previously.

The protect signal generating circuit 20 includes a protect pulse generating circuit 72 for generating the analog protect pulse APP based on the decision signal from the decision circuit 71, and a protect code signal generating circuit 74 for generating the protect code signal PCS based on the decision signal from the decision circuit 71. The analog protect pulse APP from the protect pulse generating circuit 72 and the protect code signal PCS from

the protect code signal generating circuit 74 are sent to the mixing circuit 24.

Thus the mixing circuit 24 outputs a signal corresponding to an analog video signal in a pre-set period in the vertical blanking period of which the above protect code signal PCS is mixed and on plural pseudo synchronization pulses (pseudo equivalent pulses) of which plural white peak signal are combined, as shown in Fig.12.

The above signal, that is the analog video signal having the protect code signals PCS and the analog protect pulses APC appended thereto, is outputted at the analog output terminal 29.

The analog output terminal 29 of the reproducing device 50 is connected to the analog input terminal 81 of the optical disc recording/reproducing apparatus 80 and to the analog input terminal 61 of the analog VTR 60. The analog VTR 60 analogically records the analog video signals on the video tape TP, while the optical disc recording/reproducing apparatus 80 converts the analog video signals into digital video signals which are recorded on the optical disc RD. The recording/reproducing operation by the analog VTR 60 and the optical disc recording/reproducing apparatus 80 is similar to that described above and hence is not explained in detail. It is noted that the optical disc recording/reproducing apparatus 80 detects not only the protect code signal PCS but also the analog protect pulse APP in the protect code detection circuit 88 and, on detection of the analog protect pulse APP, performs scrambling by the scrambling circuit 85, for prohibiting

unauthorized copying.

A modified embodiment of the present invention will now be explained.

Various modifications may be made in the illustrative examples of the copying management information shown in Fig.2, scrambling circuit shown in Fig.3 and the sector format shown in Figs.5 and 6.

Fig.14 shows a modification of the copying management information. Of the eight bits b7 to b0, upper two bits of b7 and b6 are allocated as the information bits CM<sub>c</sub> of the copying generation management system (CGMS) for limiting the copying generation, the next two bits b5 and b4 are allocated as trigger bits CM<sub>r</sub> of the analog protection system (APS) and the next bit b3 is allocated as the bit CM<sub>a</sub> specifying whether or not the source is an analog source. The remaining two bits b2 to b0 are undefined. If the bits (b7, b6) of the APS trigger bits CM<sub>r</sub> are (0, 0), (1, 0), (1, 1) or (0, 1), these specify copy free, one generation copying possible, copy not permitted and unused, respectively. If the bits (b5, b4) of the APS trigger bits CM<sub>r</sub> are (0, 0), (0, 1), (1, 0) or (1, 1), these specify off state, turning the pseudo-sync pulse and a split burst or color stripe as later explained on and off, respectively, turning the PSP and the 2-line split burst on, and turning the PSP and the 4-line split burst on, respectively. If the bit b3 of CM<sub>a</sub> is 1 or 0, it specifies an analog package medium and otherwise, respectively.

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The contents of the APS trigger bit turning the PSP on means that the analog protect pulse APP shown in Figs.10 and 12 be inserted in a pre-set period of the vertical blanking period, such as a period between 12H and 19H. The split burst being on means that the color burst inserted on the trailing side of the horizontal blanking pulse in the horizontal blanking period be partially reversed, while the two-line split burst on means reversing color burst two lines on end every 17 lines. The four-line split burst on means reversing color burst four lines on end every 21 lines. The color burst reversion is an operation of reversing a portion, for example, a forward half portion, of the color burst signal, or changing its phase. Such reversed split color burst produces color interference, such as generation of color stripes, in the copied color video signals.

Fig.15 illustrates the reversed split color burst APS. In a line in which the color burst is reversed, part of the color burst CB, as a reference signal of the color sub-carrier arrayed on the trailing side of the horizontal synchronization pulse HD, such as a hatched portion in Fig.15, is reversed in phase. That is, the color burst period  $C_N$  in the standard NTSC system is 9 cycles. To the front side of the standard period  $C_N$  of the color burst is connected a burst signal of, for example, two cycles, as a pre-period  $C_p$ , to provide a sum total of 11 cycles. The two cycles of the pre-period  $C_p$  and 3.5 cycles of the front period  $C_f$  of the former half portion in the color burst standard period  $C_N$ ,



totalling at 5.5 cycles, are reversed in burst phase, while 5.5 cycles of the latter back portion  $C_s$  in the color burst standard period  $C_N$  remain intact.

The color burst signal, partially reversed in phase, is generated in, for example, the protect pulse generating circuit 72 of Figs.11 or 12 and sent to the mixing circuit 24, where the phase reversed color burst signal is mixed two lines on end every 17 lines for two line split burst on, while being mixed four lines on end every 21 lines for four line split burst on.

As for the split burst operation, part of the color burst is reversed in phase, that is by  $180^\circ$ . However, the color burst phase may also be changed by  $90^\circ$  or  $270^\circ$  or by an optional angle. The period of phase change can be set optionally without being limited to 5.5 cycles.

Fig.16 shows another illustrative example of a scrambling circuit which may be used in place of the above-described scrambling circuit shown in Fig.3. In the illustrative example of Fig.16, the 15-bit shift register 41 for scrambling is similar to the illustrative example shown in Fig.3 except that feedback conforming to the generating polynomial  $x^{15} + x^4 + 1$  is employed, using an exclusive-OR (ExOR) gate 42. Thus the common portions are denoted by the same reference numerals and the corresponding description is omitted for simplicity.

In place of the illustrative example of the sector format shown in Figs.5 and 6, a sector format shown in Fig.17 may be used.

In the embodiment of Fig.17, each sector is made up of 12 rows, each row being made up of 172 bytes, thus totalling at 2064 bytes, of which 2048 bytes represent main data. At the leading position of the first of 12 rows, 4-byte ID (identification data), 2-byte IED (ID error detection code) and a 6-byte RSV (spare) are arrayed in this order. A 4-byte error detection code (EDC) is arrayed at the terminal position of the last row.

Of the 4 bytes of ID (identification data), the first MSB side byte (bits b31 to b24) represent the sector information, with the remaining three bytes (bits b23 to b0) represent the sector numbers, as shown in Fig.18. The sector information is made up of a 1-bit sector format type, a 1 bit of the tracking method, a 1 bit of reflectance, a 1 bit spare, 2 bits of area types and 2 bits of the layer number, looking from the MSB side.

The copying management information may be provided at a pre-set position in the sector format. For example, in a sector format of the data area, a byte of the 6 bytes of RSV may be used, whereas, in a sector format in the TOC area, several bytes or several tens of bytes of the main data portion may be collected and used as an area for the copying management information.

The above description has been made in connection with recording/reproduction on or from an optical disc or a video tape. For example, if digital data, in which part of the transmission control information similar to the copying management information is transmitted as the key information, is scrambled or ciphered,



information decision circuit 19 in advance. Since the TOC information is acquired first, the information derived from the TOC information may be employed.

With the above-described arrangement of the present invention, it becomes possible to combat unauthorized copying for the analog copying and digital copying simultaneously.

Although the optical disc and the video tape are used as the signal record medium in the above description, it is also possible to use magnetic recording media, such as so-called IC cards, hard discs or flexible discs, while it is possible to use an optical disc of the type in which recording is done by pits. In addition, a phase change type optical disc, an organic dye type optical disc, an optical disc recorded by UV laser light or optical discs having multi-layer recording films, may be used, in addition to the magneto-optical discs. A variety of tape-shaped recording media, such as video tapes, may also be employed.

CLAIMS

Claim 1. A method for reproducing digital data from a signal record medium, comprising:

reading out the recording control information arrayed in a playback mode control signal area for controlling the mode of the playback state of said signal record medium and/or in each header of the digital data divided into sectors; and

performing a pre-set conversion operation on an analog signal, converted from said digital data by D/A conversion, based on said recording control information.

Claim 2. The signal reproducing method as claimed in claim 1 wherein a pre-set conversion operation is performed on said digital data based on said recording control information.

Claim 3. The signal reproducing method as claimed in claim 2 wherein the pre-set conversion operation on said digital data is the operation of digitally descrambling said digital data.

Claim 4. The signal reproducing method as claimed in claim 2 wherein said digital data is ciphered data and said pre-set conversion operation on said digital data is the operation of deciphering the digital data using at least a portion of the recording control information.

Claim 5. The signal reproducing method as claimed in claim 2 wherein said digital data is ciphered data and said pre-set conversion operation on said digital data is the operation of deciphering said digital data by decoding means specified by at

least a portion of said recording control information.

Claim 6. The signal reproducing method as claimed in claim 1 wherein said analog signal is an analog video signal and wherein the pre-set operation of conversion into said analog video signals is an operation of arraying a combination signal of plural pseudo synchronization pulses and plural white peak signals across plural horizontal periods in a vertical blanking period of said analog video signal.

Claim 7. The signal reproducing method as claimed in claim 1 wherein said analog signal is an analog color video signal and wherein said pre-set conversion operation for said analog color video signals is the operation of changing the phase of at least a portion of color burst signals.

Claim 8. The signal reproducing method as claimed in claim 1 wherein the pre-set conversion operation is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 9. The signal reproducing method as claimed in claim 8 wherein said analog signal is an analog video signal and said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 10. The signal reproducing method as claimed in claim 8 wherein said coded signal includes a recording inhibiting signal and/or a generation limitation instructing signal instructing limitation on the recording generation.

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Claim 11. An apparatus for reproducing digital data from a signal recording medium, comprising:

means for reading out the recording control information arrayed in a playback mode control signal area for controlling the mode of the playback state of said signal recording medium and/or in each header of the digital data divided into sectors; and

means for performing a pre-set conversion operation on an analog signal, converted from said digital data by D/A conversion, based on said recording control information.

Claim 12. The signal reproducing apparatus as claimed in claim 11 wherein a pre-set conversion operation is performed on said digital data based on said recording control information.

Claim 13. The signal reproducing apparatus as claimed in claim 12 wherein the pre-set conversion operation on said digital data is the operation of digitally descrambling said digital data.

Claim 14. The signal reproducing apparatus as claimed in claim 12 wherein said digital data is ciphered data and said pre-set conversion operation on said digital data is the operation of digitally converting said digital data.

Claim 15. The signal reproducing apparatus as claimed in claim 12 wherein said digital data is ciphered data and said pre-set conversion operation on said digital data is the operation of deciphering said digital data by decoding means specified by at least a portion of said recording control information.

Claim 16. The signal reproducing apparatus as claimed in claim 11

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wherein said analog signal is an analog video signal and wherein the pre-set operation of conversion into said analog video signals by said conversion means is an operation of arraying a combination signal of plural pseudo synchronization pulses and plural white peak signals across plural horizontal periods in a vertical blanking period of said analog video signal.

Claim 17. The signal reproducing apparatus as claimed in claim 11 wherein said analog signal is an analog color video signal and wherein said pre-set conversion operation on said analog color video signals by said conversion means is the operation of changing the phase of at least a portion of color burst signals.

Claim 18. The signal reproducing apparatus as claimed in claim 11 wherein the pre-set conversion operation on said analog color video signals by said conversion means is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 19. The signal reproducing apparatus as claimed in claim 18 wherein said analog signal is an analog video signal and said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 20. The signal reproducing apparatus as claimed in claim 18 wherein said coded signal includes a recording inhibiting signal and/or a generation limitation instructing signal instructing limitation on recording generation.

Claim 21. A method for recording a signal comprising:



generating the recording control information for supervising recording of said signal on a signal record medium;

ciphering said signal using at least a part of said recording control information as the key information;

arraying said recording control information at a pre-set position of a playback mode control signal area designed to control the mode of the playback state of said signal record medium and/or at a pre-set position of each recording unit of said signal on said signal record medium; and

recording on said signal record medium said recording control information arrayed at the pre-set position of said playback mode control signal area and/or the pre-set position of each recording unit along with said ciphered signal.

Claim 22. The signal recording method as claimed in claim 21 wherein said signal is digital data or an analog signal.

Claim 23. A signal recording apparatus comprising:

recording control information generating means for generating the recording control information for supervising the recording of said signal on a signal record medium;

ciphering means for ciphering the signal using at least a portion of said recording control signal as the key information;

annexing means for annexing said recording control information at a playback mode control signal area designed to control the mode of the playback state from said signal record medium and/or at a pre-set position of each recording unit of said signal on said



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Claim 28. The signal reproducing method as claimed in claim 27 wherein said decoded and reproduced signal is an analog video signal and wherein the pre-set operation of conversion into said analog video signals is an operation of arraying a combination signal of plural pseudo synchronization pulses and plural white peak signals across plural horizontal periods in a vertical blanking period of said analog video signal.

Claim 29. The signal reproducing method as claimed in claim 27 wherein said decoded and reproduced signal is an analog color video signal and wherein said pre-set conversion operation for said analog color video signals is the operation of changing the phase of at least a portion of color burst signals.

Claim 30. The signal reproducing method as claimed in claim 27 wherein the decoded and reproduced signal is an analog signal and wherein said pre-set conversion operation to said analog signal is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 31. The signal reproducing method as claimed in claim 30 wherein said analog signal is an analog video signal and said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 32. The signal reproducing method as claimed in claim 30 wherein said coded signal includes a recording inhibiting signal and/or a generation limitation instructing signal instructing limitation on the recording generation.

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Claim 33. A signal reproducing apparatus for reproducing the ciphared signal from a signal record medium comprising:  
readout means for reading out the recording control information arrayed at a playback mode control signal area designed to control the mode of the playback state of said signal record medium and/or at a pre-set position of each recording unit of the signal on said signal record medium;

decoding means for deciphering said ciphared signal using at least a portion of said recording control information as the key information for reproduction.

Claim 34. The signal reproducing apparatus as claimed in claim 33 wherein said signal is digital data or an analog signal.

Claim 35. The signal reproducing apparatus as claimed in claim 33 further comprising conversion means for performing pre-set conversion on the decoded and reproduced signal using at least a portion of said recording control information as the key information.

Claim 36. The signal reproducing apparatus as claimed in claim 35 wherein the decoded and reproduced signal is an analog video signal and wherein said pre-set conversion into said analog video signal in said conversion means is an operation of arraying a combination signal of plural pseudo synchronization pulses and plural white peak signals over plural horizontal periods within a vertical blanking period of the analog video signal.

Claim 37. The signal reproducing apparatus as claimed in claim 35

wherein said decoded and reproduced signal is an analog color video signal and wherein said pre-set conversion operation on said analog color video signals by said conversion means is the operation of changing the phase of at least a portion of color burst signals.

Claim 38. The signal reproducing apparatus as claimed in claim 35 wherein the decoded and reproduced signal is an analog signal and wherein said pre-set conversion operation on said analog signal by said conversion means is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 39. The signal reproducing apparatus as claimed in claim 38 wherein said analog signal is an analog video signal and said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 40. The signal reproducing apparatus as claimed in claim 38 wherein said coded signal includes a recording inhibiting signal and/or a generation limitation instructing signal instructing limitation on the recording generation.

Claim 41. A signal transmission method for receiving and reproducing transmitted digital data comprising:

taking out the transmission control information for supervising transmission ancillary to the transmitted digital data;

taking out the transmission control information for supervising transmission ancillary to transmitted digital data; and

performing pre-set conversion on said digital data and an



video signals is the operation of changing the phase of at least a portion of color burst signals.

Claim 47. The signal transmission method as claimed in claim 41 wherein the pre-set conversion operation on said analog color video signals is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 48. The signal transmission method as claimed in claim 47 wherein said analog signal is an analog color video signal and said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 49. The signal transmission method as claimed in claim 48 wherein said coded signal includes a recording inhibiting signal and/or a generation limitation instructing signal instructing limitation on the recording generation.

Claim 50. A signal transmission apparatus for receiving and reproducing transmitted digital data comprising:

means for taking out the transmission control information for supervising transmission ancillary to the transmitted digital data;

means for taking out the transmission control information for supervising transmission ancillary to transmitted digital data; and

means for performing pre-set conversion on said digital data and an analog signal converted by D/A conversion from said digital data based on said transmission control operation.

Claim 51. The signal transmission apparatus as claimed in claim 50 wherein the pre-set conversion operation on said digital data by

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said conversion means is the operation of digitally scrambling said digital data.

Claim 52. The signal transmission apparatus as claimed in claim 50 wherein the said digital data is ciphered and wherein said pre-set conversion operation on said digital data by said pre-set conversion means is the operation of deciphering said digital data using at least a portion of said transmission control information as the key information.

Claim 53. The signal transmission apparatus as claimed in claim 50 wherein the digital data is the ciphered data and wherein the pre-set conversion operation on said digital data by said conversion means is the operation of deciphering said digital data by decoding means instructed by at least a portion of said recording control information.

Claim 54. The signal transmission apparatus as claimed in claim 50 wherein said analog signal is an analog video signal and wherein the pre-set operation of conversion on said analog video signals by said conversion means is an operation of arraying a combination signal of plural pseudo synchronization pulses and plural white peak signals across plural horizontal periods in a vertical blanking period of said analog video signal.

Claim 55. The signal transmission apparatus as claimed in claim 50 wherein said analog signal is an analog color video signal and wherein said pre-set conversion operation for said analog color video signals by said conversion means is the operation of changing



the phase of at least a portion of color burst signals.

Claim 56. The signal transmission apparatus as claimed in claim 50 wherein said pre-set conversion operation on said analog signal by said conversion means is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 57. The signal transmission apparatus as claimed in claim 50 wherein said analog signal is an analog color video signal and wherein said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 58. The signal transmission apparatus as claimed in claim 58 wherein said coded signal includes a transmission inhibiting signal and/or a generation limitation instructing signal instructing limitation on the transmission generation.

Claim 59. A signal transmission method comprising:

generating the transmission supervising information for supervising signal transmission;

ciphering said signal using at least a portion of said transmission control information as the key information; and

transmitting the ciphered signal and also transmitting the transmission control information ancillary to the ciphered signal.

Claim 60. The signal transmission method as claimed in claim 59 wherein said signal is digital data or an analog signal.

Claim 61. A signal transmission apparatus comprising:

transmission control information generation means for generating the transmission control information for supervising signal

transmission;

ciphering means for ciphering the signal using at least a portion of the transmission control information as the key information;

annexing means for annexing said transmission control information to said ciphered signal; and

transmission means for transmitting the transmission control information annexed to said ciphered signal along with the ciphered signal.

Claim 62. The signal transmission apparatus as claimed in claim 61 wherein said signal is digital data or an analog signal.

Claim 63. A signal transmission method for receiving a transmitted ciphered signal and reproducing the received signal, comprising:

taking out the transmission control signal for supervising transmission ancillary to the ciphered signal; and

deciphering said signal using at least a portion of said transmission control information as the key information.

Claim 64. The signal transmission method as claimed in claim 63 wherein said signal is digital data or an analog signal.

Claim 65. The signal transmission method as claimed in claim 63 wherein a pre-set conversion is performed on the decoded and reproduced signal using at least a portion of said transmission control information as the key information.

Claim 66. The signal transmission method as claimed in claim 65 wherein the decoded and reproduced signal is an analog video signal

and wherein said pre-set conversion into said analog video signal is an operation of arraying a combination signal of plural pseudo synchronization pulses and plural white peak signals over plural horizontal periods within a vertical blanking period of the analog video signal.

Claim 67. The signal transmission method as claimed in claim 65 wherein said decoded and reproduced signal is an analog color video signal and wherein said pre-set conversion operation on said analog color video signals is the operation of changing the phase of at least a portion of color burst signals.

Claim 68. The signal transmission method as claimed in claim 65 wherein the decoded and reproduced signal is an analog signal and wherein said pre-set conversion operation on said analog signal is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 69. The signal transmission method as claimed in claim 68 wherein said analog signal is an analog video signal and said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 70. The signal transmission method as claimed in claim 68 wherein said coded signal includes a transmission inhibiting signal and/or a generation limitation instructing signal instructing limitation on the transmission generation.

Claim 71. A signal transmission apparatus for receiving and reproducing a transmitted ciphered signal, comprising:

take-out means for taking out the transmission control information for supervising transmission ancillary to the ciphered signal; and

decoding means for deciphering said signal using at least a portion of said transmission control information as the key information.

Claim 72. The signal transmission apparatus as claimed in claim 71 wherein said signal is digital data or an analog signal.

Claim 73. The signal transmission apparatus as claimed in claim 71 wherein a pre-set conversion is performed on the decoded and reproduced signal using at least a portion of said transmission control information as the key information.

Claim 74. The signal transmission apparatus as claimed in claim 73 wherein the decoded and reproduced signal is an analog video signal and wherein said pre-set conversion into said analog video signal by said conversion means is an operation of arraying a combination signal of plural pseudo synchronization pulses and plural white peak signals over plural horizontal periods within a vertical blanking period of the analog video signal.

Claim 75. The signal transmission apparatus as claimed in claim 73 wherein said decoded and reproduced signal is an analog color video signal and wherein said pre-set conversion operation on said analog color video signals by said conversion means is the operation of changing the phase of at least a portion of color burst signals.

Claim 76. The signal transmission apparatus as claimed in claim 73 wherein the decoded and reproduced signal is an analog signal and wherein said pre-set conversion operation on said analog signal by said conversion means is the operation of arraying a signal coded with plural bits at a pre-set position in the analog signal.

Claim 77. The signal transmission apparatus as claimed in claim 76 wherein said analog signal is an analog video signal and said pre-set position is a pre-set horizontal period within a vertical blanking period of said analog video signal.

Claim 78. The signal transmission apparatus as claimed in claim 76 wherein said coded signal includes a transmission inhibiting signal and/or a generation limitation instructing signal instructing limitation on the transmission generation.

Claim 79. A signal record medium wherein the recording control information for supervising recording of a signal on a signal record medium is recorded at a playback mode control signal area for controlling the mode of the playback state and/or a pre-set position of each recording unit of the signal, and wherein at least a portion of the recording control information is ciphered and recorded using at least a portion of the recording control information as the key information.

Claim 80. The signal record medium as claimed in claim 79 wherein said signal is digital data or an analog signal.

Claim 81. A video signal reproducing apparatus for reproducing a digital disc medium having recorded thereon a digitized video

signal and a recording control code for outputting at least an analog video signal, wherein said recording control code is arrayed in a playback mode control signal area provided at a beginning end of a recording track for controlling the mode of the playback state and/or in each header of a digital video signal divided into sectors, comprising:

detection means for detecting the state of the recording control code arrayed in said playback mode control signal area and/or in each header;

means for generating a recording scrambling signal and/or a recording inhibiting signal of the mode of the analog video signal based on a detection output of said detection means;

D/A conversion means for converting the digital video signal reproduced from the digital disc medium into an analog video signal;

annexing means for annexing said recording scrambling signal and/or said recording inhibiting signal in a pre-set area of a vertical blanking period of the D/A converted analog video signal; and

outputting means for outputting said analog video signal.

Claim 82. The video signal reproducing apparatus as claimed in claim 81 wherein said recording scrambling signal is comprised of a combined signal of plural pseudo synchronization pulses and plural white peak signals, said combined signal being arrayed across plural horizontal periods in said vertical blanking period.



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digital disc medium into an analog video signal;

annexing said recording scrambling signal and/or said recording inhibiting signal in a pre-set area of a vertical blanking period of the converted analog video signal; and outputting said analog video signal having annexed thereto said recording scrambling signal and/or the recording inhibiting signal.

Claim 87. The video signal reproducing method as claimed in claim 86 wherein said recording scrambling signal is comprised of a combined signal of plural pseudo synchronization pulses and plural white peak signals, said combined signal being arrayed across plural horizontal periods in said vertical blanking period.

Claim 88. The video signal reproducing method as claimed in claim 86 wherein said recording scrambling signal is a signal obtained on changing the phase of at least a portion of a color burst signal.

Claim 89. The video signal reproducing method as claimed in claim 86 wherein said recording inhibiting signal is a coded signal coded with plural bits and arrayed in a pre-set horizontal period within said vertical blanking period.

Claim 90. The video signal reproducing method as claimed in claim 86 wherein said coded signal is a generation limitation instructing signal instructing limitation on the recording generation.

Claim 91. A combination apparatus of a video signal reproducing apparatus and a recording apparatus for reproducing a digital disc medium having recorded thereon a digitized video signal and a video



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recording control code, reproducing at least the analog video signal, outputting at least the analog video signal and recording the outputted signal, wherein said video recording control code is arrayed in a playback mode control signal area provided at a beginning end of a recording track for controlling the mode of the playback state and/or in each header of the digital video signal divided into sectors, comprising:

detection means for detecting the state of the recording control code arrayed in said playback mode control signal area and/or in each header;

means for generating a recording scrambling signal of the mode of the analog video signal based on a detection output of said detection means;

D/A conversion means for converting the digital video signal reproduced from the digital disc medium into an analog video signal annexing means for annexing said recording scrambling signal in a pre-set area of a vertical blanking period of the D/A converted analog video signal;

outputting means for outputting said analog video signal;

inputting means for inputting said analog video signal;

automatic amplitude adjustment means for responding to said video recording scrambling signal of said input analog signal; and

recording means for recording said input analog video signal on an analog video record medium.

Claim 92. A combination apparatus of a video signal reproducing

apparatus and a recording apparatus for reproducing a digital disc medium having recorded thereon a digitized video signal and a video recording control code, reproducing at least the analog video signal and recording the outputted signal, wherein said video recording control code is arrayed in a playback mode control signal area provided at a beginning end of a recording track for controlling the mode of the playback state and/or in each header of the digital video signal divided into sectors, comprising:

detection means for detecting the state of the recording control code arrayed in said playback mode control signal area and/or in each header;

means for generating a video recording inhibiting signal of the mode of the analog video signal based on a detection output of said detection means;

D/A conversion means for converting the digital video signal reproduced from the digital disc medium into an analog video signal;

annexing means for annexing said recording inhibiting signal in a pre-set area of a vertical blanking period of the D/A converted analog video signal;

outputting means for outputting said analog video signal;

inputting means for inputting said analog video signal;

video recording inhibiting means for responding to said video recording inhibiting signal of said input analog video signal; and

recording means for recording said input analog video signal

on an analog video record medium; wherein the analog video signal reproduced from said digital disc medium is re-recorded analogically or digitally.

Claim 93. The combination apparatus of the video signal reproducing apparatus and the recording apparatus as claimed in claim 92 wherein said video recording inhibiting means for responding to the video recording inhibiting signal of said input analog video signal enables a video recordable state depending on the generation mode of said video recording inhibiting signal.

Claim 94. A combination method of a video signal reproducing method and a recording method for reproducing a digital disc medium having recorded thereon a digitized video signal and a video recording control code, reproducing at least the analog video signal and recording the outputted signal, wherein said video recording control code is arrayed in a playback mode control signal area provided at a beginning end of a recording track for controlling the mode of the playback state and/or in each header of the digital video signal divided into sectors, comprising:

detecting the state of the recording control code arrayed in said playback mode control signal area and/or in each header;

generating a video recording scrambling signal of the mode of the analog video signal based on a detection output; converting the digital video signal reproduced from the digital disc medium into an analog video signal;

annexing said recording scrambling signal in a pre-set area



inputting said analog video signal; and

effecting video recording inhibition responsive to said video recording inhibiting signal of said input analog signal when analogically or digitally recording said input analog video signal on a video recording medium.

Claim 96. The combination method of the video signal reproducing method and the recording method as claimed in claim 95 wherein said video recording inhibiting means responding to the video recording inhibiting signal of said input analog video signal enables a video recordable state depending on the generation mode of said video recording inhibiting signal.

Claim 97. A digital disc medium for coping with a method for reproducing a video signal comprising detecting the state of a recording control code arrayed in a playback mode control signal area and/or in each header of a digital video signal divided into sectors, generating a recording scrambling signal and/or a recording inhibiting signal of the mode of the analog video signal based on a detection output; converting the digital video signal reproduced from the digital disc medium into an analog video signal; annexing said recording scrambling signal and/or said recording inhibiting signal in a pre-set area of a vertical blanking period of the converted analog video signal; and outputting said analog video signal having annexed thereto said recording scrambling signal and/or the recording inhibiting signal; wherein the improvement resides in that it has recorded thereon the

video recording control code along with a digitized video signal, said video recording control code being arrayed in a playback mode control signal area provided at a beginning portion of a recording track for controlling the mode of the playback state and/or in each header of the digital video signal divided into sectors.

Claim 98. The digital disc medium as claimed in claim 97 wherein said video recording control code signal is a signal functioning for generating a combination signal of plural pseudo synchronization pulses and plural white peak signals across plural horizontal periods within said vertical blanking period.

Claim 99. The digital disc medium as claimed in claim 97 wherein said video recording control code signal is a signal functioning for changing the phase of at least a portion of a color burst signal.

Claim 100. The digital disc medium as claimed in claim 97 wherein said video recording control code signal is a signal functioning for generating a signal coded with plural bits in a pre-set horizontal period within said vertical blanking period.

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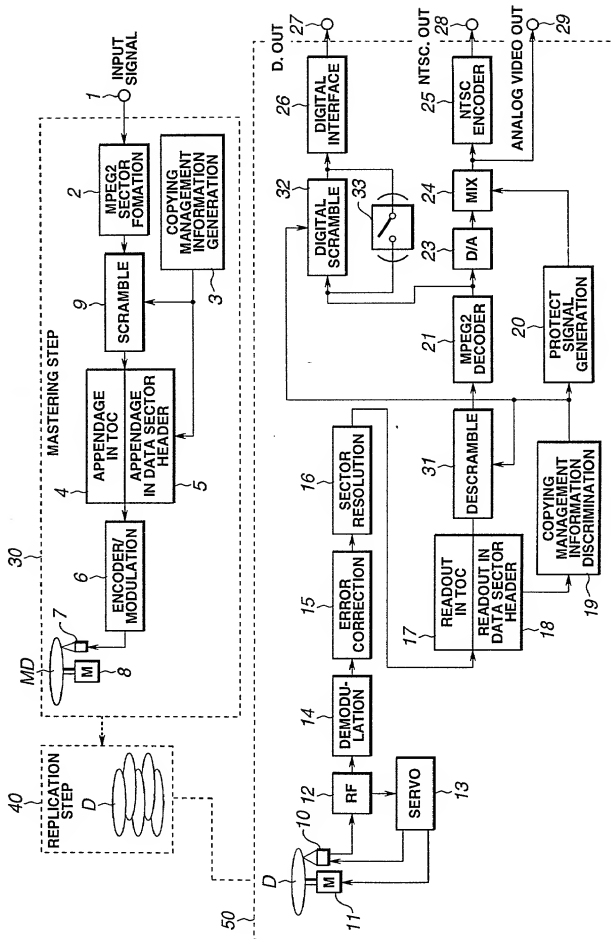
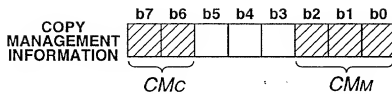


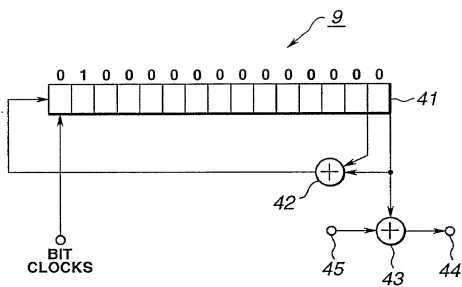
FIG.1



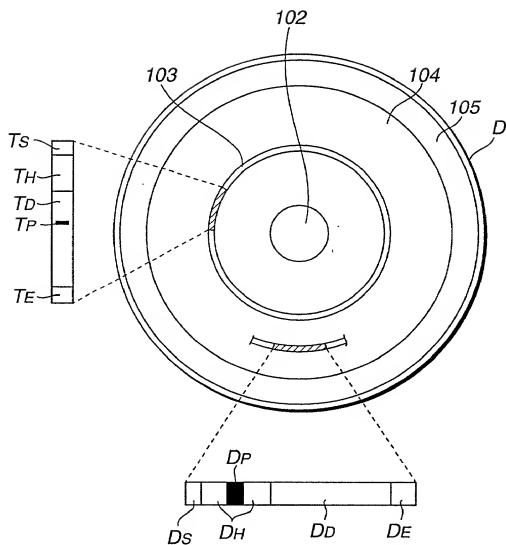


**FIG.2**

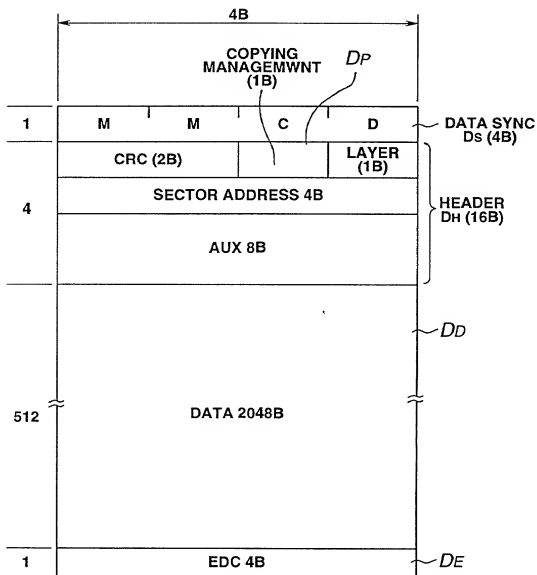
**Figure 6.** The effect of the number of iterations on the accuracy of the proposed algorithm. The figure shows two plots side-by-side. The left plot is titled "Accuracy vs. Number of Iterations" and the right plot is titled "Error vs. Number of Iterations". Both plots show results for three different values of  $\alpha$ : 0.1, 0.2, and 0.3. In the accuracy plot, the accuracy increases rapidly from iteration 100 to 1000 and then levels off. Higher values of  $\alpha$  result in higher final accuracies. In the error plot, the error decreases as the number of iterations increases, with lower values of  $\alpha$  generally resulting in smaller errors.



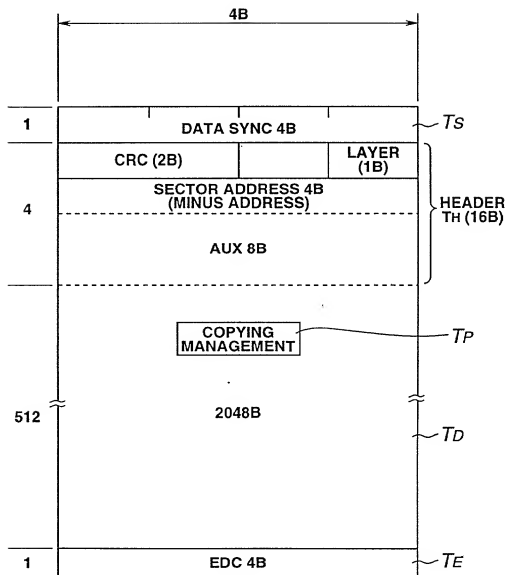
**FIG.3**



**FIG.4**



**FIG.5**



**FIG.6**

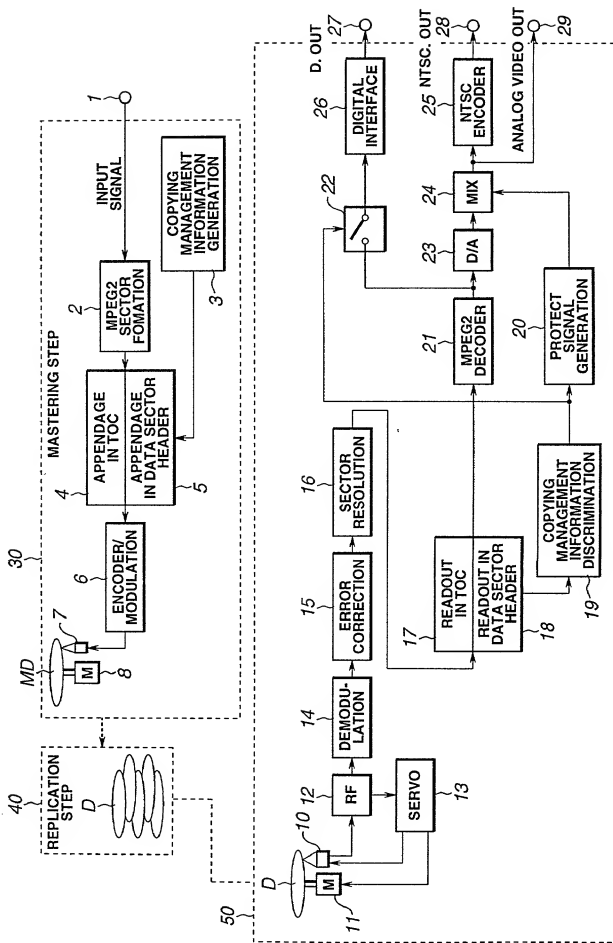


FIG.7

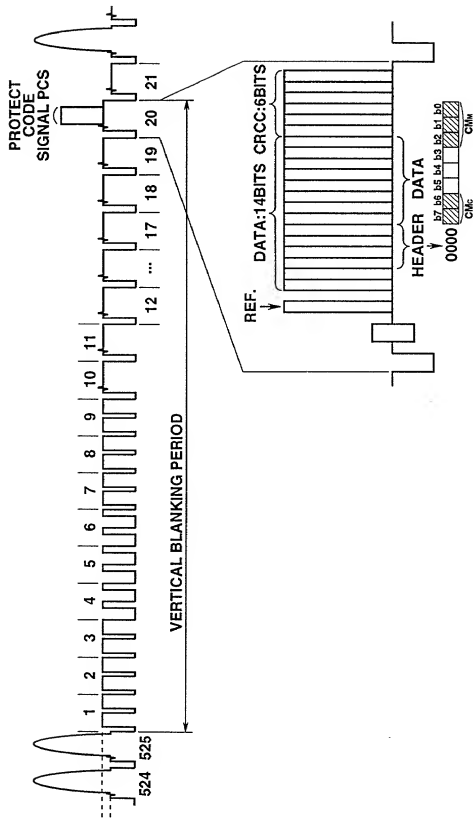


FIG.8

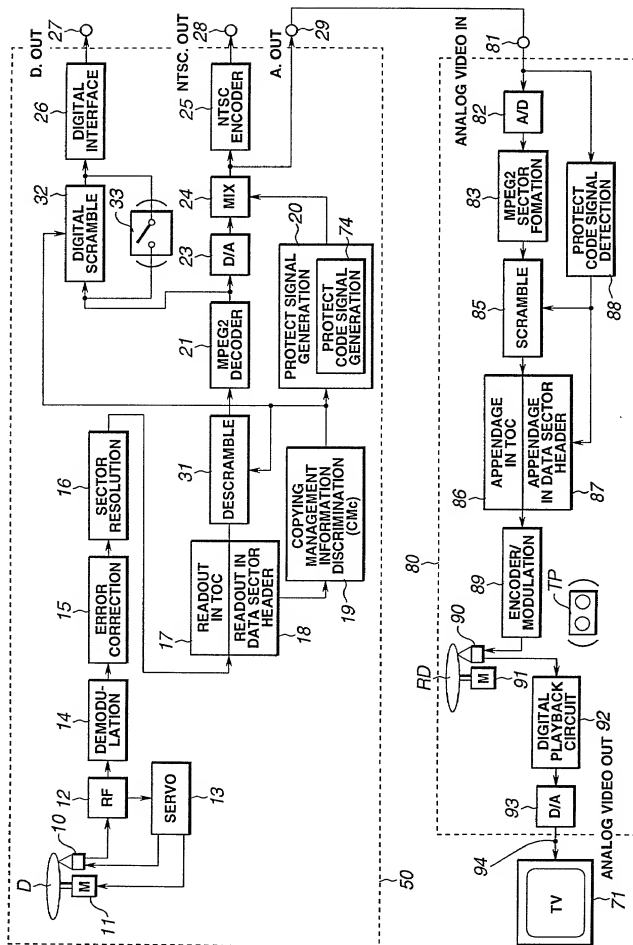


FIG.9



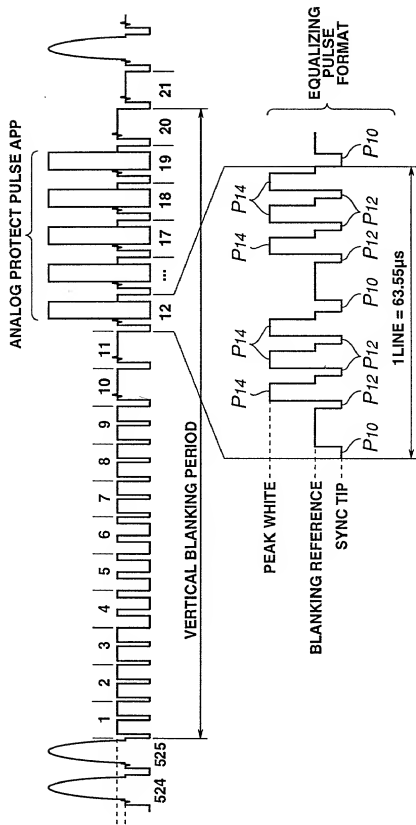
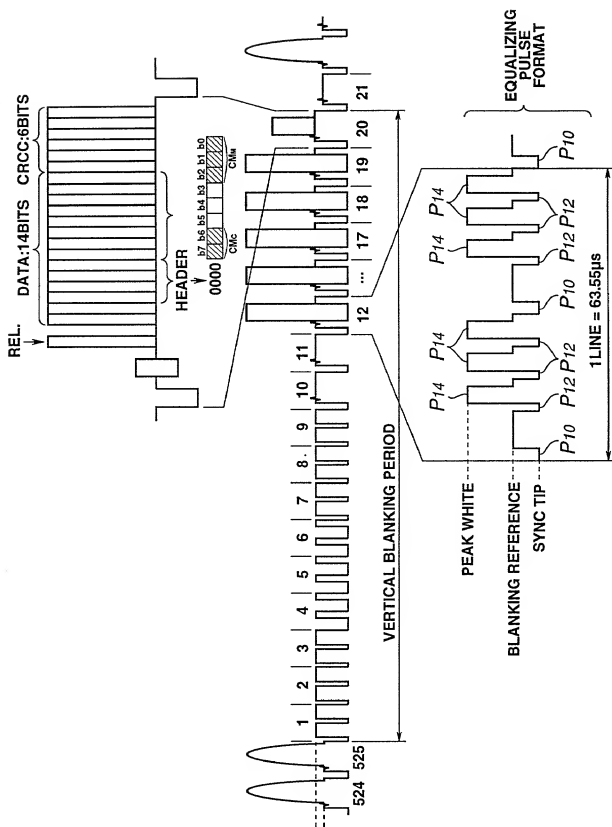


FIG.10

**FIG. 11**



**FIG. 12**

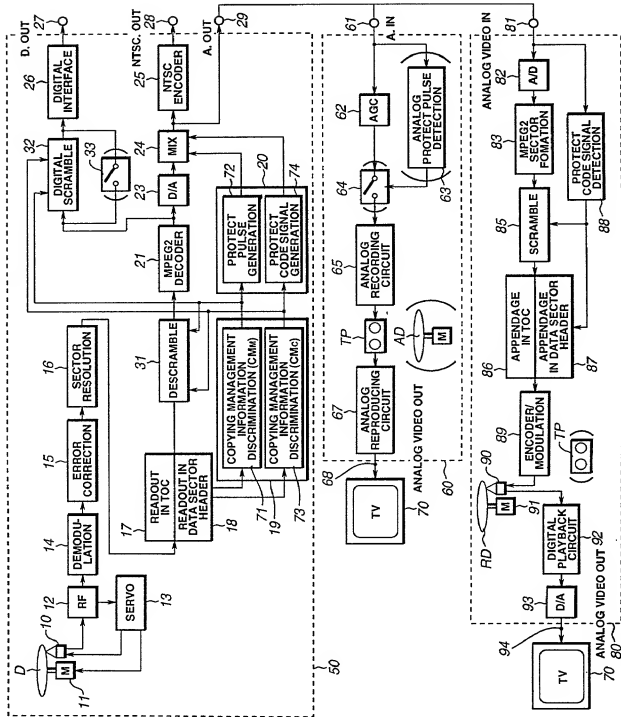


FIG.13

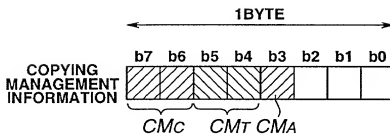


FIG.14

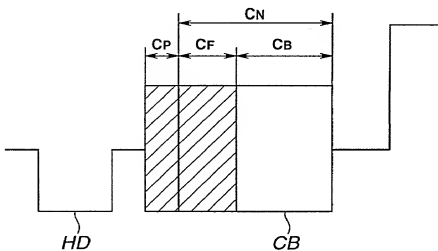
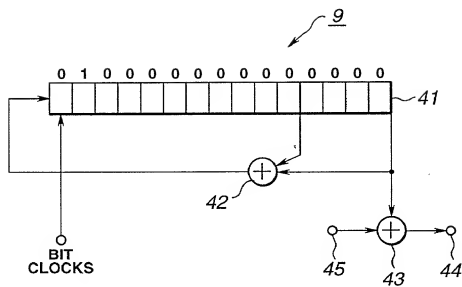
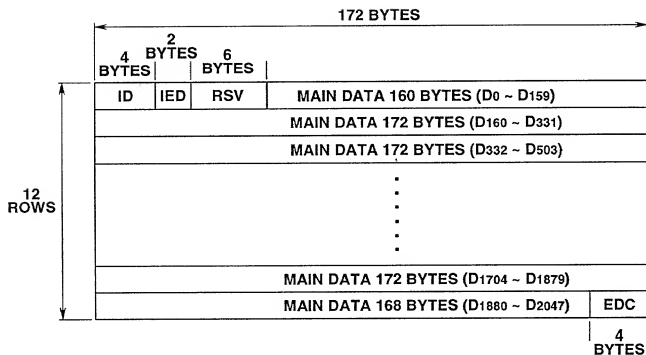


FIG.15

**FIG.16**



**FIG.17**





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**DECLARATION FOR PATENT APPLICATION (JOINT OR SOLE)**  
(Under 37 CFR § 1.63; with Power of Attorney)  
**CURTIS, MORRIS & SAFFORD, P.C. File No. 450100-3601**

As a below named inventor, I hereby declare that:  
My residence, post office address and citizenship are as stated below next to my name,  
I believe I am the original, first and sole inventor (if only one name is listed below) or an  
original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed  
and for which a patent is sought on the invention ENTITLED:  
**SIGNAL REPRODUCING/RECORDING/TRANSMITTING METHOD AND APPARATUS  
AND SIGNAL RECORDING MEDIUM**

the specification of which

\_\_\_\_\_ is attached hereto.

X was filed on July 19, 1996 as Application Serial No. 08/690,226,

with amendment(s) through \_\_\_\_\_ (if applicable, give dates).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)	(List additional applications on separate page):	Priority Claimed:		
Number:	Country:	Filed (Day/Month/Year):	Yes	No
07-185724	Japan	21/07/95	x	
07-185725	Japan	21/07/95	x	
08/121988	Japan	16/05/96	x	

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56, which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Prior U.S. Application(s) (List additional applications on separate page):

Appln. Ser. Number:	Filed (Day/Month/Year):	Status (patented, pending, abandoned):
---------------------	-------------------------	--

I hereby appoint WILLIAM S. FROMMER, Registration No. 25,506,

and ALVIN SINDERBRAND, Registration No. 16,313, and CURTIS, MORRIS & SAFFORD, P.C., Registration No. 12,761, or their duly appointed associate, my attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to file continuation and divisional applications thereof, to receive the Patent, and to transact all business in the Patent and Trademark Office and in the Courts in connection therewith, and specify that all communications about the application are to be directed to the following correspondence address:

WILLIAM S. FROMMER, Esq.  
c/o CURTIS, MORRIS & SAFFORD, P.C.  
530 Fifth Avenue  
New York, New York 10036

Direct all telephone calls to:  
(212) 840-3333  
to the attention of:  
WILLIAM S. FROMMER

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR(S):

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Residence: Chiba, Japan  
Citizenship: Japan

Date: November 5, 1996

Signature: Shigeyuki Yoneyama  
Full name of 2nd joint inventor (if any): SHIGEYUKI YONEYAMA  
Residence: Tokyo, Japan  
Citizenship: Japan

Date: November 11, 1996

Signature: \_\_\_\_\_  
Full name of 3rd joint inventor (if any):  
Residence:  
Citizenship:

Date: \_\_\_\_\_

(Similarly list additional inventors on separate page)  
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Notes: In order to qualify for reduced fees available to Small Entities, each inventor and any other individual or entity having rights to the invention must also sign an appropriate separate "Verified Statement (Declaration) Claiming (or Supporting a Claim by Another for) Small Entity Status" form (e.g. for Independent inventor, Small Business Concern, Nonprofit Organization, Individual Non-Inventor).

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant(s) : Yoichiro Sako and Shigeyuki Yoneyama  
Serial No. : Continuation of 08/690,224  
For : SIGNAL  
REPRODUCING/RECORDING/TRANSMITTING  
METHOD AND APPARATUS AND SIGNAL  
RECORD MEDIUM  
Filed : Herewith  
Examiner : Bernarr Earl Gregory  
Art Unit : 2766

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New York, NY 10151

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Date of Deposit: January 7, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" Service under 37 CFR 1.10 on the date indicated above and is addressed to: Assistant Commissioner for Patents, Washington, DC 20231.

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(Typed or printed name of person mailing paper or fee)

Edward Nay  
(Signature of person mailing paper or fee)

**REQUEST FOR APPROVAL OF CORRECTED DRAWINGS**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Attention: Official Draftsperson

Sir:

In the above-identified patent application, the approval of the Examiner for the following drawing corrections is requested:

Please change the labeling of the drawing elements as indicated in the attached  
copies of Figs. 1, 7, 9, 11 and 13.

Kindly charge any costs related to this drawing change to Deposit Account No.  
50-0320.

Respectfully submitted,

FROMMER LAWRENCE & HAUG LLP  
Attorneys for Applicants



Bruno Polito  
Registration No. 38,580  
(212) 588-0800

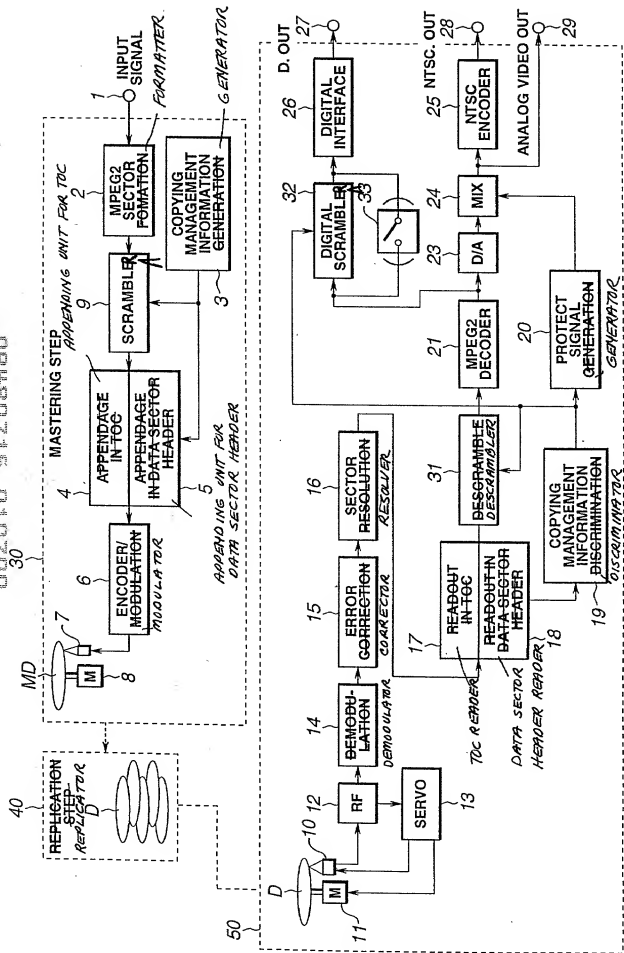


FIG.1

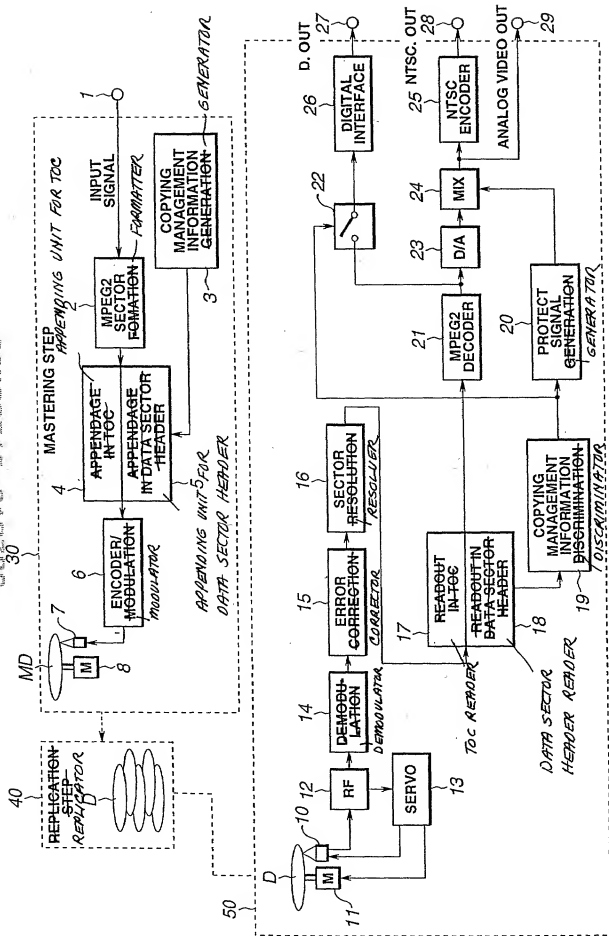
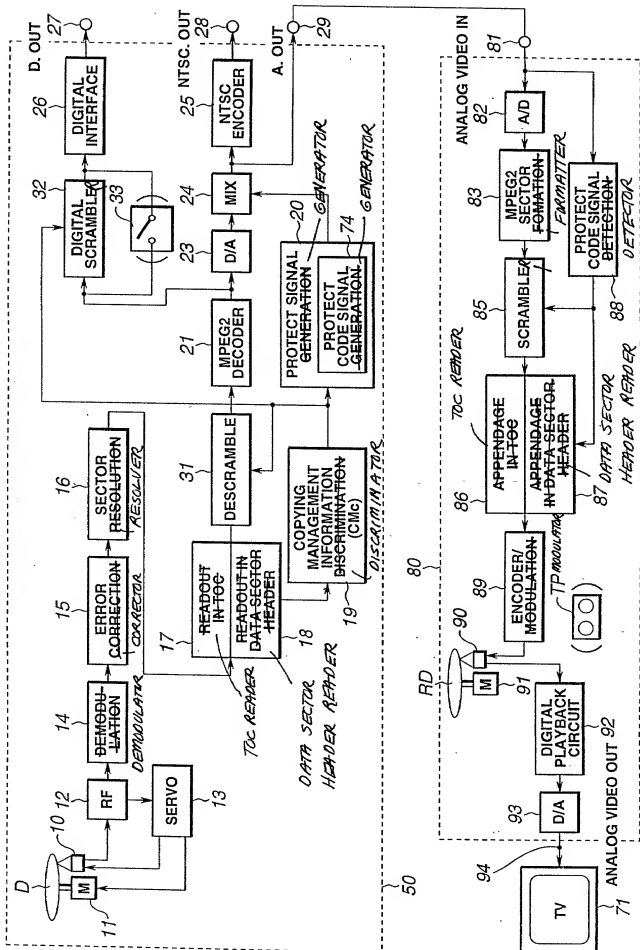
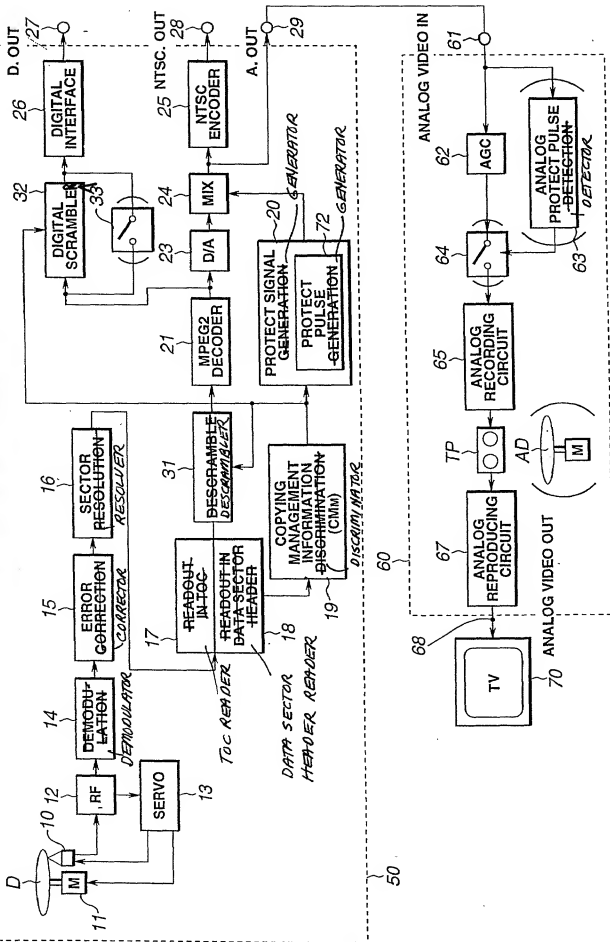
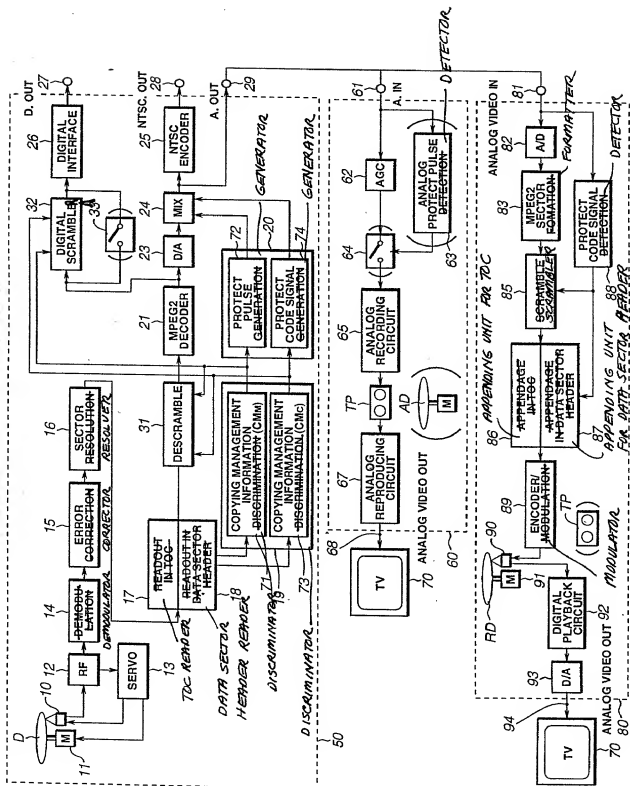


FIG.7



**FIG. 9**





**FIG. 13**